The Canadian Medical Association Journal

Vol. 60 JUNE, 1949 No. 6

# INITIAL CLINICAL EXPERIENCE WITH ANTABUSE*

**Frank Gelbman, M.D. and N. B. Epstein, M.D.**

*Montreal, Que.*

JACOBSEN, Hald, Martensen-Larsen, and co-workers[1 to 6] have reported in some detail the chemistry and pharmacology of "antabuse" (tetraethylthiuramdisulphide) and their results with 83 patients.[7] A tremendous interest, both lay and medical, in this new drug treatment of alcoholism has resulted. Recently, the clinical results on 100 persons with alcoholism treated for 6 to 12 months have been reported.[8]

The purpose of this paper is to describe the early clinical experiences with antabuse at the Allan Memorial Institute of Psychiatry. Since January 24, 1949, an initial group of 55 alcoholics were treated with antabuse in order to obtain clinical data and to plan a series of whatever further studies might be indicated.

## Selection of Cases

Several factors were considered in the selection of each candidate for therapy with antabuse. Each person had to express a genuine desire to take the treatment. Moreover, it was necessary that a responsible relative or friend take a part in the total treatment plan for each patient. Each candidate had to be healthy, free from concurrent infection, sober, not psychotic and over 21 years of age. Each granted his permission for treatment in writing.

In this group of 55 patients, there was an age span from 22 to 64; pre-treatment systolic blood pressures varied from 106 to 186. There were 9 females in the series.

## Treatment Plan

1. Each candidate for treatment came to the Institute at 1 p.m. accompanied by a relative, close friend, social worker, or sponsor (member of Alcoholics Anonymous). Each had been instructed not to consume any alcohol for 48 hours before arriving. The latter procedure was adopted because the only death reported in the literature* had occurred in a man started on antabuse while he was in the midst of an extended drinking spree.

2. A medical history was obtained and a routine physical examination was done. For research purposes, all had a Cornell Selectee Service Index Test and were given the "Draw a Person" test. Some had a complete blood count.

3. In the presence of the person who accompanied him, each patient was given a brief talk about the treatment, and then swallowed 4 pills (0.5 gm. each).

The following facts were emphasized: (*a*) Antabuse has no effect until alcohol is taken; (*b*) the patient would not be able to drink alcohol in any form without severe reactions. The necessity of the antabuse pills was compared to that of insulin in diabetes.

Each patient was given 5 pills to take home. He was instructed to take 3 pills on the following morning, 2 pills on the second morning, and to report back to the Institute with someone at 2 p.m. on the second afternoon, for his "experience session". He was asked to bring his own alcoholic beverage.

4. The "experience session" was held in groups of 2 to 5 patients. Each patient was allowed to drink at his usual rate. No one was urged to drink more than he desired. As a general rule, it was necessary to slow the rate of drinking. After a few observations of patients suffering from too severe vomiting, a policy of not permitting the consumption of more than 8 ounces of whiskey was established.

## Effects of Antabuse Plus Alcohol

The reaction of alcohol with antabuse occurred within 2 to 15 minutes, or after 2 to 6 ounces of liquor, or before a quart of beer could be consumed. The following signs were ob-

* From the Department of Psychiatry, Allan Memorial Institute, McGill University, Montreal.

The authors wish to express their thanks to Ayerst, McKenna and Harrison Limited for their generous supply of "Antabuse" that made this study possible.

* Since preparing this paper, the case reported by Dr. R. O. Jones has been sent in for publication, and appears in this present issue.

served, usually in the following order of appearance:

1. Flushing of the head and neck, spreading downwards, later, sometimes, covering most of the body.
2. Vasodilatation of the capillaries of the conjunctiva, later with some conjunctival œdema.
3. Sweating.
4. Hyperpnœa.
5. Dyspnœa.
6. Tachycardia.
7. Decrease in blood pressure.
8. Odor of acetaldehyde on the breath.
9. Somnolence.
10. Sleep.
11. Vomiting—in a majority of patients.

Subjective complaints usually were expressed in the following sequence:

1. Warmth.
2. Dizziness.
3. Blurred vision.
4. Pressure on top of the head.
5. Pounding headache—particularly in the temples or behind the ears.
6. Palpitations.
7. Difficulty in breathing.
8. Tightness in the throat.
9. Chest pain.
10. Numbness of the hands and feet.
11. Nausea.
12. Sleepiness.

Almost every patient then fell asleep for 1 to 3 hours. Some of them vomited quite suddenly upon awakening.

A small oxygen tank was kept available for emergency use. Only 2 patients required oxygen inhalation on account of dyspnœa; 2 others were given oxygen because of anxiety secondary to dyspnœa. Each time, oxygen afforded immediate subjective and objective relief.

As soon as the patient desired and seemed able to do so, he was permitted to go home. This usually occurred from 3.30 to 7.00 p.m., depending on the nature and severity of the reaction. On leaving, the patient (in the presence of the person who accompanied him) was given 15 pills, instructed to take one pill each morning and to report back in 2 weeks for more pills. Thus, all patients who continued therapy were seen at 2-week intervals.

Each patient was told to call the Institute in case of any difficulty. The person accompanying the patient was asked to co-operate in helping that the patient take an antabuse tablet each morning.

## Follow-up Program

When the patient returned each 2 weeks for more antabuse he was given a chance to talk about his adjustment to abstinence and his desire for liquor. On an empirical basis, the daily dosage of antabuse has been reduced to ½ pill (0.25 gm.) daily in some cases. The problem of maintenance dosage has not been solved, but it is essential that antabuse is taken every day. Some patients have had a complete blood count every month.

In order to protect the patient on antabuse who might take alcohol outside, and develop symptoms which would be misunderstood and cause him embarrassment in public, small cards (3 inches by 5 inches) have been printed for patients to carry in their possession. This card states:

"To whom it may concern: The bearer of this card ..... of ..... Telephone ..... is taking "Antabuse". The drug alone is harmless. When combined with alcohol, symptoms of marked flushing, perspiration, redness of the eyeballs, difficulty in breathing, odour of acetone on breath, palpitations, vomiting, and low blood pressure will be marked. If such a reaction occurs and is severe, please call the Royal Victoria Hospital and get in touch with the doctor on call at the Allan Memorial Institute".

## Results

It is far too early to draw any conclusions about long term results with antabuse. But in spite of the short time that this drug has been used, certain indications are apparent.

Of the total of 55 patients, 2 failed to return for the "experience session". After the controlled experience of alcohol and antabuse, 4 failed to return. Of the remaining 49 patients, 4 are known to have discontinued antabuse and have reverted to their old drinking habits. Among the remaining 45, 4 have remained sober without taking more antabuse and 41 are taking the drug regularly. Of this last number 4 patients who have confessed to trying to drink alcohol have had a typical reaction and have therefore been unable to continue drinking. It is rather interesting that one of these patients had a reaction with only one glass of wine; another reacted to a single glass of beer. There have been 4 people who reported reactions while taking medicines with an alcoholic base (vitamins, cough mixtures, sedative, proprietaries). Patients should be warned about these possible sources.

Because of their pleas for help, 2 patients were given antabuse but were not permitted to drink in an "experience session". A very obese man, aged 45, and a 66 year old man with a history of angina pectoris were given antabuse, observed an "experience session", and were warned about the increased danger of alcohol

in their particular cases. Each was instructed to call the Institute if he felt the urge to drink alcohol. Both of these men have remained sober.

In only one patient was antabuse discontinued because of a complication. It is not certain what part, if any, antabuse played in his reaction. This 58 year old man, an undiagnosed mild diabetic, weighing 240 pounds, 6 feet 2 inches tall, had a questionable history of 2 minor "strokes" with fleeting memory loss and confusion. His "experience session" was a routine one, but 2 weeks later, while taking 1 antabuse tablet daily, he suddenly developed convulsions followed by unconsciousness, hemiparesis and amnesia. There was no evidence of bleeding into the spinal fluid. He was hospitalized and made a complete recovery in 10 days. This reaction should be remembered in view of a personal communication from one of Dr. Jacobsen's co-workers (Dr. Eric Glud) that diabetics may develop a severe coma if not very carefully observed and controlled while taking antabuse. This unpublished communication states that 2 diabetics (one was an undiagnosed diabetic) have died in severe and irreversible diabetic coma while taking antabuse. The mechanism of this reaction is still unknown.

Thus far, no changes in the red cell count, white cell count, hæmoglobin or differential have been found.

There have been many and varied complaints from alcoholics shortly after starting on antabuse therapy. These complaints include insomnia, somnolence, diarrhœa, constipation, anorexia, increased appetite, headache, palpitations, dizziness, urinary frequency, enuresis, nocturia, bad taste in the mouth. The symptoms are transient, disappearing within 1 to 6 weeks. They are self-limited or respond to simple explanation that sobriety, not antabuse, is causing the symptoms. Here, it may be postulated that anxiety, which was formerly controlled by means of alcohol, seeks other expressions during the early period of abstinence from alcohol.

In this series, 3 patients developed skin rashes. In each case, the rash was easily eliminated by routine anti-histaminic therapy (pyribenzamine, 50 mgm., t.i.d.) for 3 or 4 days, without discontinuing antabuse.

Many patients have desired to stop taking antabuse after 1 to 6 weeks of sobriety. A surprisingly large number insisted that they had lost all appetite for liquor. This overconfidence must be considered a source of potential danger. Premature termination of antabuse will undoubtedly result in inadequate evaluation of the effects of the drug. Frequent visits to the physician, help from friends and relatives, and some form of psychotherapy can help insure an adequate period of therapy with antabuse.

At this time, it appears that the emotional adjustments of alcoholics to treatment with antabuse fall into 5 broad groups.

1. A few in whom alcohol seems to be the only major field of difficulty. These people respond extremely well to antabuse therapy. Their adjustment appears so good that there is little need for psychotherapy.

2. Those who have an initial period of anxiety and recover with mild residual anxiety. These people make a satisfactory adaptation with support and guidance.

3. Those who react with anxiety and have more or less of a struggle to continue therapy. These people can also adjust with psychotherapy from a physician.

4. Those who are unable to carry on too successfully and will discontinue therapy and revert to their old drinking habits without deeper psychotherapy.

5. Those who are totally incapable of adjusting to sobriety. In spite of many promises and frequent attempts they will not faithfully continue therapy. These people obviously need intensive psychotherapy.

## SUMMARY

1. A clinical treatment procedure and early results in 55 alcoholics treated with antabuse is described. Thus far, there are 45 of the series who have not reverted to their old drinking habits. The 10 "failures" include 6 people who were not adequately followed after starting on antabuse.

2. To insure adequate evaluation of antabuse therapy, a social approach to include relatives, friends, associates and Alcoholics Anonymous is necessary. This means a slight departure from the traditional individual patient-physician relationship.

3. Thus far, a few skin rashes and one potentially serious complication have been observed. Antabuse may be contraindicated in diabetics.

4. It is recommended that the first trial with alcohol, after taking antabuse, should be under controlled conditions. This should be done in either a doctor's office or in a hospital, so long as medical aid and oxygen is immediately available.

5. Antabuse should not be given if a person has been drinking recently. At present, a minimum period of 48 hours of sobriety is recommended before starting on therapy with antabuse.

6. Because of the limited knowledge of the action of antabuse, arrangements should be made to check each patient at least once every 2 weeks after his controlled experience of the effects of antabuse plus alcohol.

7. It is recommended that each person taking antabuse carry a card stating that he is using this drug.

8. A tentative classification of reactions to abstinence from alcohol while using antabuse is suggested.

9. Antabuse appears to be a valuable drug in the total treatment of alcoholism. Valuable psychotherapeutic measures which have been used in the past are still a necessary part of the successful treatment of alcoholism.

REFERENCES

1. HALD, J., JACOBSEN, E. AND LARSEN, V.: *Acta Pharm. et Toxicol.*, 4: 285, 1948.
2. *Idem*: *The Lancet*, 255: 1001, 1948.
3. ASMUSSEN, E., HALD, J., JACOBSEN, E. AND JORGENSEN, G.: *Acta Pharm. et Toxicol.*, 4: 297, 1948.
4. HALD, J. AND JACOBSEN, E.: *Acta Pharm. et Toxicol.*, 4: 305, 1948.
5. ASMUSSEN, E., HALD, J. AND LARSEN, V.: *Acta Pharm. et Toxicol.*, 4: 311, 1948.
6. LARSEN, V.: *Acta Pharm. et Toxicol.*, 4: 321, 1948.
7. MARTENSEN-LARSEN, O.: *The Lancet*, 255: 1004, 1948.
8. JACOBSEN, E. AND MARTENSEN-LARSEN, O.: *J. Am. M. Ass.*, 139: 14, 1949.

## VITAMIN $B_{12}$ IN PERNICIOUS ANÆMIA

**J. Kaufmann, M.D., F.R.C.P.[C.]* and A. Cooperberg, M.D.†**

*Montreal, Que.*

SINCE the demonstration by Minot and Murphy[1] that liver is effective in the treatment of pernicious anæmia, many attempts have been made to isolate the active substance in pure form. The greatest difficulty, however, has been the lack of adequate numbers of test subjects. When Shorb[2] demonstrated that a growth factor in refined liver for *Lactobacillus lactis Dorner* (L.L.D. Factor) appeared to be related to the activity of the extract for pernicious anæmia, Rickes *et al.*[3] utilized this test organism to isolate minute quantities of a highly active crystalline substance from liver which they called vitamin $B_{12}$. This consists of red crystalline needles and contains cobalt and nitrogen. Cobalt alone was without effect either for *L. lactis*, or pernicious anæmia in relapse.[4]

West[5] treated three patients with pernicious anæmia in relapse with single intramuscular injections of vitamin $B_{12}$. He obtained good clinical and hæmatologic improvement with a reticulocyte peak up to 27% on the fifth day. More recently Hall and Campbell[6, 7] reported the results of 11 cases of pernicious anæmia treated with vitamin $B_{12}$. The dosage varied from 42 to 220 micrograms per patient. Good hæmatologic and neurologic improvement followed. They suggest that 1 microgram of vitamin $B_{12}$ is equivalent to 1 U.S.P. unit of liver extract. A single case of a patient who was sensitive to liver extract and developed severe acute combined system disease while on inadequate folic acid therapy, responded to vitamin $B_{12}$ quite dramatically. There was no evidence of any allergy to the purified substance, though sensitivity to a test dose of liver extract persisted.[8] Spies[9, 11, 19] has found vitamin $B_{12}$ effective in a few cases of tropical sprue as well as in two patients with pernicious anæmia.

In England, a simultaneous purification of the liver extract factor was made by Smith[20] who later also found that this red crystalline material had a molecular weight of 1,500 and contained 4% cobalt.[21] Ungley[22, 23] showed that 10 micrograms of Smith's crystalline substance produced a maximal reticulocyte and red cell response and that it is as effective as liver in subacute combined degeneration. Megaloblastic anæmias of pregnancy, however, did not respond to higher dosages, although they did well with small amounts of folic acid.[22] A good response was also noted in two cases of tropical sprue.[24]

The story that unfolds about vitamin $B_{12}$ is as fascinating as the folic acid story.[25] A number of growth factors have recently been found related to the liver extract factor. An "animal protein factor" has been found necessary for the hatchability of hens' eggs[14] and for chick growth.[13] A "cow manure factor" has been equally effective in promoting the growth of

* Division of Hæmatology, Department of Medicine, Royal Victoria Hospital, Montreal.

† Fellow in Hæmatology, Department of Medicine, Royal Victoria Hospital, Montreal.

chicks.[12] A "factor X" in concentrated anti-pernicious anæmia liver extract necessary for the growth of rats has been discovered and this is related to the above factors.[15] Stokstad *et al.*[16] found that a non-motile rod-shaped organism from hen fæces could produce the animal protein factor. Concentrates of this substance were standardized against refined liver extracts and found effective in 2 patients with pernicious anæmia. The concentrates were, however, less potent than the liver extract. It has also been demonstrated that vitamin $B_{12}$ has chick growth activity similar to the above factors.[17]

When folic acid was found to produce hæmatologic remission but frequently precipitated neurologic relapse it was suggested that there were possibly 2 separate deficiencies associated in pernicious anæmia.[26] With vitamin $B_{12}$ a chemically pure substance effective for both manifestations of pernicious anæmia, this assumption no longer seems tenable.[18]

Recent reports have shown that vitamin $B_{12}$ is inactive orally unless given with normal gastric juice. This suggests to these authors that the extrinsic factor may be identical with or closely related chemically to the anti-pernicious anæmia principle of liver which is itself presumably identical with vitamin $B_{12}$.[27, 28] Stools of untreated patients with pernicious anæmia have been found to contain vitamin $B_{12}$, as determined by bioassay, in amounts up to 1.8 $\mu$g. per gram of dried fæces.[29] It, therefore, appears that the function of the gastric juice is to facilitate absorption of vitamin $B_{12}$ rather than to react with the extrinsic factor as was previously assumed.[27, 29]

### CASE 1

A.C.,* a 71-year old white female was well till six months prior to admission when she developed loss of appetite, fatigue and gradually increasing weight loss. She stated that she had always been obese, her usual weight being 170 pounds, but on admission she weighed 110 pounds. She had continued with her household duties till six weeks prior to admission when she suffered from dyspnœa and retrosternal pain on exertion. The pain was located in the upper third of the sternum and lasted but a few moments. During this time she found it increasingly difficult to do any work, requiring frequent rest periods. Her family had also noticed that her memory for recent events was poor and that she had become quite irritable.

The patient was born in England but has lived in Canada since the age of 14. She had suffered no serious illnesses, accidents, or operations. For many years she had indigestion with some nausea and occasional vomiting. She was usually constipated and used laxatives frequently. There was no history of melæna or hæmatemesis.

About three years ago she had "rheumatism" with swelling of both ankles and knees associated with numbness and tingling in her legs which cleared spontaneously. She denied having any paræsthesias since the onset of her present illness.

The family history was non-contributory. She had had her menopause about twenty years ago.

The patient was a pale, white-haired elderly female showing evidence of marked weight loss. The skin was very dry and inelastic. The scleræ had a lemon-coloured tinge. The papillæ were absent at the edges of the tongue. The chest was clear. The thyroid gland was not palpated. Pulse was regular with a rate of 82. The blood pressure was 130 systolic and 50 diastolic. The peripheral arteries were sclerotic. The heart was not enlarged to percussion. There were harsh mitral and aortic systolic murmurs present. There were no pulsating neck veins and no peripheral œdema. The liver and spleen were not palpable and rectal examination was negative. All joints were freely movable.

The cranial nerves were intact, but the corneal reflex was absent bilaterally. There was no rombergism. Vibration sense was absent in both lower extremities only. She was able to tie her own shoe laces and button her clothes adequately. The deep and superficial reflexes were normal.

A barium meal showed no evidence of any gastro-intestinal lesion. The A.C. sugar was 100 and P.C. 124 mgm. %. The basal metabolic rate was +6%. The bilirubin was 0.55 mgm. % direct and 1.1 mgm. % in-

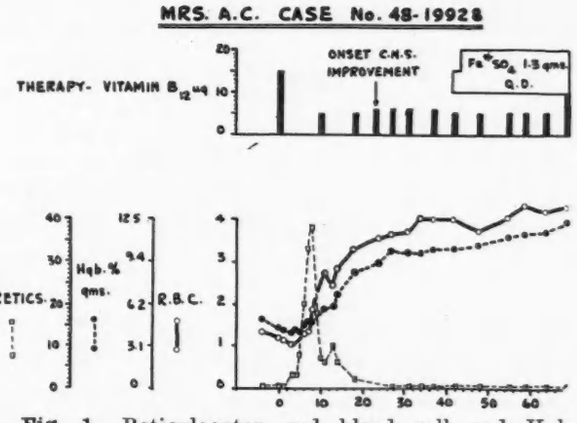



**Fig. 1.**—Reticulocytes, red blood cell and Hgb. response to vitamin $B_{12}$ in Case 1.

direct and fell to 0.6 mgm. % on the fifth day after treatment. The peripheral blood findings (Fig. 1) showed a marked hyperchromic macrocytic anæmia. The hæmoglobin was 33%, the red cells 1,370,000, the colour index 1.27, the mean corpuscular volume 123 cubic microns, the mean corpuscular hæmoglobin 39.2$_{\gamma\gamma}$ and the mean corpuscular hæmoglobin concentration 31.9%. The white blood count was 3,400 with 10% hypersegmented polymorphonuclear cells. The platelet count was 140,000. A bone marrow puncture revealed a megaloblastic marrow. A gastric analysis was attempted on three occasions, but because of the patient's mental state they were unsuccessful. However, from the history, physical and laboratory findings, it was felt that this was a true case of pernicious anæmia.

*Progress.*—On admission, the patient appeared to be alert and bright although she tended to repeat the same statements frequently and her behaviour was rather suggestive of senility. Two days after the first injection of 15 micrograms of vitamin $B_{12}$* she became confused, talked and worried a good deal about her family affairs, and wanted to shop for her groceries. She became irritable and unco-operative, and this was particularly prominent

* We wish to thank Dr. W. C. Gowdey for permission to study and follow this patient.

* The vitamin $B_{12}$ used here was made available to us by Merck and Co., and Ayerst, McKenna and Harrison Ltd.

at night. Her blood picture improved rapidly, with a reticulocyte peak of 38% on the seventh day after the injection. Her hæmoglobin, red cells, white cells and platelets continued to rise, but her mental state deteriorated somewhat. She also developed occasional paræsthesias and impaired vibration sense in her hands. After two weeks of hospitalization the patient was discharged to her home. She returned at five-day intervals for treatment. Following the first few injections her son stated that her mental behaviour appeared to be worse than usual in the evening following the injections.

About three weeks after the start of therapy (Fig. 1) her hæmoglobin had risen to about 65% after which it appeared to rise more slowly, but from this time her mental and neurological improvement occurred quite rapidly. This was noted both by her family and during her visits to the hospital for injections. The vibration sense in her hands returned first, and by the fifth week was also present in her legs. The paræsthesias were less frequent and less severe, and the retrosternal pain disappeared.

A bone marrow puncture, repeated four days after the start of therapy, revealed a normoblastic marrow and only an occasional megaloblast was seen.

### CASE 2

J.F., a 59-year old white male with known pernicious anæmia and diabetes mellitus since 1942, was readmitted because of pernicious anæmia in relapse due to lack of adequate therapy for 14 months. He complained of anorexia and increasing weight loss of 50 lb. during the past year, weakness and dyspnœa on exertion for 2

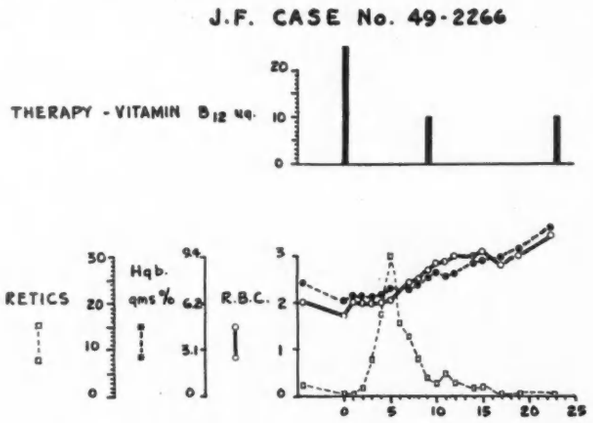



**Fig. 2.**—Reticulocytes, red blood cell and Hgb. response to vitamin $B_{12}$ in Case 2.

months. There were no symptoms referable to the tongue, gastro-intestinal or central nervous system.

Physical examination revealed an obese white male with marked pallor and lemon yellow tint to the conjunctivæ and skin. Temperature was 99.6°; pulse 100; respiration 32 and blood pressure 130/60. Tongue was pale but papillæ were well formed. The spleen was palpable about 2 inches below the left costal border, and the liver 4 inches below the right costal border. Cranial nerves, reflexes and sensations were all normal.

The hæmoglobin was 40% (6.2 gm.); red blood cells 1,730,000 with a colour index of 1.17; M.C.V. 106 cu. M.C.H. 36.7$\gamma\gamma$. The white blood cell count was 2,700 and some hypersegmented polymorphonuclear cells were present in the smear. Platelets were 230,000. Following an injection of 25 micrograms vitamin $B_{12}$ there was a reticulocyte peak of 30% on the 5th day, associated with an improvement in appetite and general well-being (Fig. 2). The bilirubin was 0.5 mgm. % direct and total 1.35 mgm. %.

A barium series revealed no evidence of any gastro-intestinal lesion. The gastric juice showed no free hydrochloric acid after histamine.

## DISCUSSION

The two patients were treated with small amounts of vitamin $B_{12}$ at repeated intervals so that the average daily dose was scarcely more than 1 microgram. This resulted in a reticulocyte and other hæmatologic response as adequate as with the most potent liver extract available. It is of interest that the central nervous system manifestations in Case 1 appeared to become aggravated following the onset of therapy and during hæmatologic improvement. However, these also cleared in a relatively short time with further treatment.

It should be emphasized that all cases of pernicious anæmia treated with this vitamin and that have been reported to date have been followed for only a short period of time. Folic acid, in similar time intervals, produced equally dramatic results, but only after prolonged therapy did it become evident that neurological lesions were either aggravated or precipitated. From the evidence available at present, however, it would appear that vitamin $B_{12}$ is equally effective for both manifestations of the disease, but more prolonged therapy is necessary before this can be definitely established.

## SUMMARY

1. The literature on the use of vitamin $B_{12}$ in pernicious anæmia is reviewed.

2. Two cases treated with small doses of vitamin $B_{12}$ are reported. One patient with involvement of the central nervous system improved quite rapidly.

3. It is felt that additional cases of pernicious anæmia, particularly with central nervous system involvement should be reported, and follow-up studies carried out in order to assess fully the value of this vitamin.

## REFERENCES

1. MINOT, G. R. AND MURPHY, W. P.: *J. Am. M. Ass.*, 87: 470, 1926.
2. SHORB, M. S.: *J. Biol. Chem.*, 169: 455, 1947.
3. RICKES, E. L., BRINK, N. G., KONIUSZY, F. R., WOOD, T. R. AND FOLKERS, K.: *Science*, 107: 396, 1948.
4. *Idem*: *Science*, 108: 134, 1948.
5. WEST, R.: *Science*, 107: 398, 1948.
6. HALL, B. E. AND CAMPBELL, D. C.: *Proc. Staff Meet. Mayo Clin.*, 23: 584, 1948.
7. *Idem*: *Proc. Staff Meet. Mayo Clin.*, 23: 591, 1948.
8. BERK, L., DENNY-BROWN, D., FINLAND, M. AND CASTLE, W. B.: *New England J. Med.*, 239: 328, 1949.
9. SPIES, T. D., STONE, R. E. AND ARAMBURU, T.: *South. M. J.*, 41: 522, 1948.
10. SPIES, T. D., LOPEZ, G. G., MILANES, F., TOCA, R. L. AND CULVER, B.: *South. M. J.*, 41: 523, 1948.
11. SPIES, T. D. AND SUAREZ, R. M.: *Blood*, 3: 1215, 1948.
12. RUBIN, M. AND BIRD, H. R.: *J. Biol. Chem.*, 163: 387, 1946.
13. HAMMOND, J. C.: *Poultry Sc.*, 23: 471, 1944.
14. NESTLER, R. B., BYERLY, T. C., ELLIS, N. R. AND TITUS, H. W.: *Poultry Sc.*, 15: 67, 1936.
15. CARY, C. A., GARTMAN, A. M., DRYDEN, L. P. AND LIKELY, G. D.: *Fed. Proc.*, 5: 128, 1946.
16. STOKSTAD, E. L. R. *et al.*: *J. Lab. & Clin. Med.*, 33: 860, 1948.

17. OTT, W. H., RICKES, E. L. AND WOOD, J. R.: *J. Biol. Chem.*, 174: 1047, 1948.
18. DAMASHEK, W.: *Blood*, 4: 76, 1948.
19. SPIES, T. D., STONE, R. E., LOPEZ, G. G., MILANES, F., TOCA, R. L. AND ARAMBURU, T.: *The Lancet*, 2: 519, 1948.
20. SMITH, E. L.: *Nature*, 161: 638, 1948.
21. *Idem*: *Nature*, 162: 144, 1948.
22. UNGLEY, C. C.: *Brit. M. J.*, 2: 154, 1948.
23. *Idem*: *The Lancet*, 1: 771, 1948.
24. PATEL, J. C.: *Brit. M. J.*, 2: 934, 1948.
25. THOMPSON, D. L.: *Canad. M. A. J.*, 56: 432, 1947.
26. SARGENT, F.: *New England J. Med.*, 237: 703, 1947.
27. BERK, L., CASTLE, W. B., WELCH, A. D., HEINLE, R. W., ANKER, R. AND EPSTEIN, M.: *New England J. Med.*, 239: 911, 1948.
28. HALL, B. E., MORGAN, E. H. AND CAMPBELL, D. C.: *Proc. Staff Meet. Mayo Clin.*, 24: 99, 1949.
29. BETHELL, F. H., MEYERS, M. C. AND NELIGH, R. B.: *J. Lab. & Clin. Med.*, 33:, 1477, 1948.

## ANURIA

**C. H. W. Weinlos, M.D., F.R.C.S.[C.] and C. B. Rich, M.D., F.R.C.P.[C.]**

*Edmonton, Alta.*

IN recent years cases have been reported of anuria[1, 2] associated with sulfatherapy, incompatible blood transfusions, abortion, premature separation of placenta, crushed kidney syndrome, and hypotension. Various modes of therapy have been attempted, such as stripping of the kidney capsule, splanchnic block, peritoneal lavage, artificial kidney and lastly, judicious fluid administration as outlined by Muirhead and co-workers.

It would appear that Muirhead's[4] work sheds the best light on this as yet obscure subject, and its treatment; whereas Trueta's[3] work would appear to explain the pathology best.

To begin with, a short review of physiology will be given, perhaps not entirely in accordance with the latest accepted theory on kidney function, but suitable for this work. The circulation to the kidney is very rich in volume, compared to the size of the organ. One assumes that the intention is that a large volume of blood should be exposed to whatever the kidney offers. The glomeruli shed into the tubules a large volume of fluid. Let us take it as an established fact that this volume of fluid, containing chlorides and other inorganic compounds, passes down the tubule until it reaches the distal convoluted section, the lower nephron. This is the last stage before the collecting tubule, to which perhaps no function other than its name, can be given. The distal convoluted tubule by vital activity, puts back into the blood stream, nearly all water, chlorides and other inorganic substances such as phosphates, in a concentration suitable for the blood stream. What is left in the tubule is the urine formed. The undesirable substances are left in much higher concentration in the urine; for instance, the urine may contain urine urea nitrogen 80 times higher in concentration than the blood. If that were so, the glomerulus sheds into the tubule 80 volumes of fluid of whieh 79 volumes are reabsorbed. This would indicate that the distal convoluted tubule is a highly specialized structure, capable of doing very selective work. Should this re-absorption process fail, one can readily see what a large volume of fluid would be lost to the body.

Lately, a great deal of light has been shed by Trueta and co-workers on the circulation of the kidney. They have proved that the cortex of the kidney may be shunted out of circulation. By this shunt, nearly all glomeruli may be deprived of their blood supply, and consequently very little urine would be formed. This shunt can occur in a state of hypotension, when the body, because of loss of volume of circulating blood, would obviously be anxious to retain volume, and therefore, shut down on the formation of urine to prevent volume loss. Again the circulation may contain toxic substances which, if allowed to reach the glomeruli, might damage these permanently, and such a state would call forth a defence mechanism of shunting out cortical circulation. The initiating cortical anæmia is the first phase of the anuria, if one were to combine Muirhead's and Trueta's works.

The authors would presume to find a common denominator in abortion, premature separation of placenta, faultily matched transfusion, crushed limb, and sulfa over-dosage; namely, a state of toxæmia, wherein large volumes of noxious matter circulate in the blood stream, and reach the kidney. In such a state, it would be beneficial to shunt out the circulation from the cortex. If, however, this defence mechanism overworks, then a state of lasting anuria is brought about. Muirhead calls this the second phase of anuria.

The cortical anoxia produces a certain degree of cortical degeneration, and if one assumes that the cell of the distal convoluted tubule is the most highly specialized cell in the cortex it suffers the greatest damage. If finally, the defence mechanism lets go, which may take

anywhere from eight to ten days, and the glomeruli begin to filter again, the distal convoluted tubule having suffered most severely, fails to concentrate, or for that matter, to reabsorb anything, and in the third phase of this condition, we find the patient suddenly passing six to seven litres of urine per day.

After a few days, the cell of the distal convoluted tubule regenerates, assumes its function, begins to concentrate the urine by withdrawing water and chlorides from the inside of the tubule back into the circulation and the patient becomes normal. The diuresis initiating recovery of the patient is the third phase of the anuria according to Muirhead.

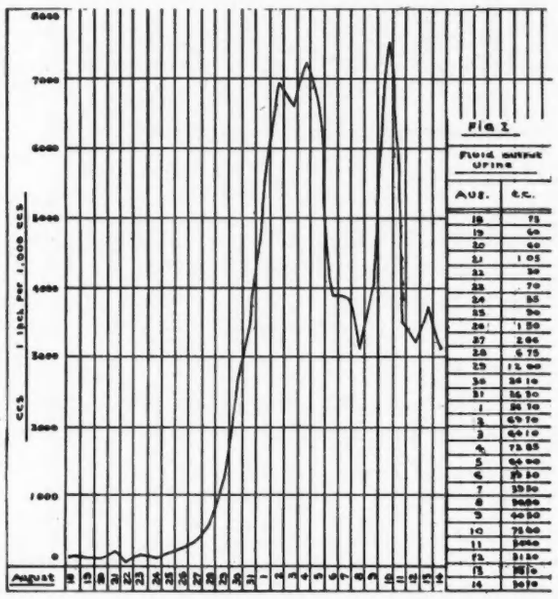
Based upon these theories, the treatment of the patient resolves itself into limited administration of fluids during the second phase and sufficient fluid during the third phase to overcome dehydration and deprivation of chlorides. One asks, where in this scheme does peritoneal lavage or the artificial kidney enter? If the patient is being judiciously treated and has not been over-hydrated early, the chances are that he will survive the second phase, without peritoneal lavage or artificial kidney. If there has been a tremendous catabolism of proteins and the urea nitrogen in the blood stream has risen to very high levels, the chances are that one might have to stand by with some mode or other of depleting the blood stream of this high waste nitrogen for fear that the patient may die before the crisis sets in.

The theories of Muirhead and Trueta outlined in the preceding chapters can be traced in the following case.

The patient, a 39-year old wife of a country electrician, believed herself to be pregnant when she missed her expected period of July 26. Following that date, she had intermittent spotting. On August 17 she ate a full meal, feeling quite well and went driving. On arrival home at 9.00 p.m., she suddenly felt sick and started bleeding severely. She said she filled a half a basin with blood. She was admitted to hospital the next noon. By now, she was nauseated and had vomited once.

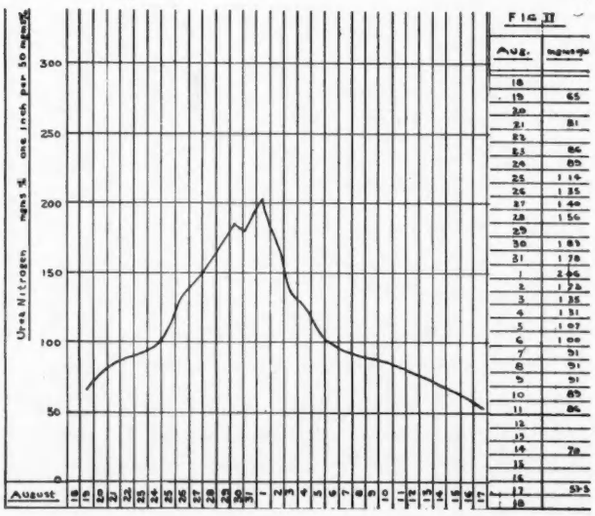
The temperature on admission was 96.2° F. Shortly after her temperature rose to 100° F. The past history was irrelevant. It was noted that she appeared slightly jaundiced. The blood pressure was 106/75, pulse 88. There was a slight tenderness over the lower abdomen. She was not passing any urine and when she was catheterized, about two drams of bloody fluid were obtained. The uterus was found patent at its os to the size of a large nickel with a firm blood clot projecting from the cervix. Under a very light anæsthesia, the products of conception were removed, and these were reported to be highly infected placenta and blood clot. Again the bladder was catheterized and no urine obtained. Following the operation she continued to vomit and in fact, vomited throughout the following 2½ weeks; so much so, that almost constant duodenal suction had to be maintained.

She passed very small quantities of urine up to August 27. On August 28, the volume of urine increased to 675 c.c. and from then on, it steadily increased, reaching a peak of 7,285 c.c. on September 4, when, because of an ensuing heart failure, the volume decreased to 3,060 c.c. on September 8; reaching a secondary peak on September 10 of 7,500 c.c.




From August 30 to September 14, she passed 75 litres of urine (Fig. I).

The urea nitrogen steadily rose to 183 mgm. % on August 30. With the ensuing diuresis, it dropped to 178 the next day, and the patient seemed improved. On September 1, when the volume of urine rose to 5,670 c.c., she became definitely worse and came close to dying because of the severe dehydration which manifested itself. The urine generally was of low specific gravity, contained blood and a gradually



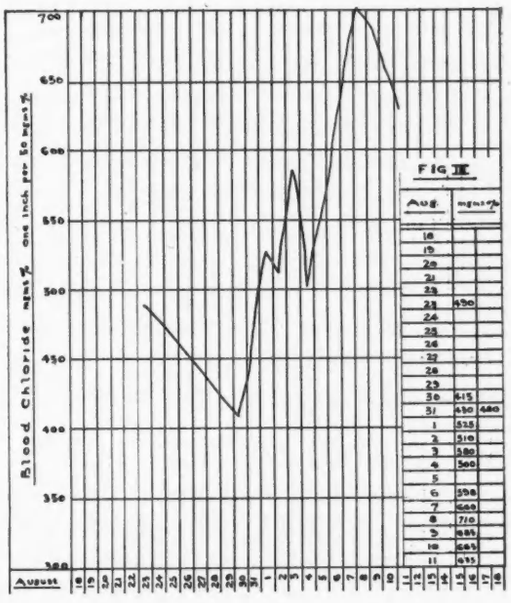

diminishing amount of albumen. The daily output of urine persisted at around 3,000 to 4,000 c.c. even after the first three weeks of diuresis, the night volume being somewhat higher than the day volume (Fig. II).

*Fluid intake.*—This was begun erroneously when fluids were pushed for the first four days and the patient soon became œdematous. She developed free fluid

in the peritoneal and both pleural cavities, and the latter had to be tapped on three occasions, yielding some 80 oz. of a clear fluid. Prior to the diuresis, the solutions employed were blood, plasma, saline glucose, and sodium R lactate solution, and 50% glucose solution. When the diuresis ensued up to 8,000 c.c., fluids had to be administered intravenously daily, for three days, and volumes of nearly 6,000 c.c. daily for two days.

Solutions employed now were blood, plasma, amigen, Ringer's solution, as well as large volumes of saline glucose as the main standby to replace the huge volume of water and chlorides lost. The purpose of the Ringer's solution was to replace calcium and potassium and when the heart action suddenly went up to an uncountable rate, magnesium sulphate was administered intramuscularly in the following dose: 20 c.c. of 25% magnesium sulphate, diluted with 60 c.c. of distilled water; 10 c.c. of this, administered q.4 h., i.m., 1 c.c. of betalin was given daily i.m. to replace the vitamin B loss. The patient vomited repeatedly and had to have duodenal suction until about September 8, when she was able to take fluids by mouth.

*Blood*—She was moderately anæmic. On admission, her white blood count was in the neighbourhood of 50,000. This, a raised van den Bergh and clinical jaundice, as well as tenderness over the liver, associated with a history of previous jaundice, and bouts of jaundice in other members of the family, made one suspect familial jaundice. However, a red cell fragility test was normal.




It is very interesting to note that the urine at the beginning of the diuresis contained a urea nitrogen not much higher than the blood urea nitrogen, for on August 30, the urine urea nitrogen was 220, and the blood urea nitrogen was 183; whereas about ten days later, the urine urea nitrogen was ten times the concentration of the blood urea nitrogen.

This would indicate that the first urine was a filtrate from the glomerulus, which the distal convoluted tubule made no attempt to concentrate, with a resultant huge loss of water and chlorides to the body. This can be fatal, if not immediately replaced. In calling attention to this fact, lies the greatest contribution of Muirhead's work to the reasonable treatment of this condition.

*Blood chlorides.* — The blood chlorides constantly went down to low levels during the first days of the diuresis, figures as low as 415 mgm. % being reached on August 30, and the highest peak recorded September 8, when the blood chlorides rose to 710 mgm. % in spite of the many litres of saline glucose having been administered (Fig. III).

*$CO_2$ combining power.* — During the first days of anuria, an uræmic acidosis prevailed, which was combated by sodium R lactate solution.

*Blood pressure.*—It is interesting to note that the blood pressure did not rise to very high levels but when it collapsed with the rapid heart rate, the volume of urine diminshed, only to increase again when the blood pressure rose with a slower pulse.

## CONCLUSIONS

A case of anuria is reported. The literature in this field is briefly discussed. A possible pathological disturbance in the physiology of the distal convoluted tubule is brought forth. Judicious fluid administration as emphasized by Muirhead is given its rightful place in the treatment. Artificial modes of waste elimination are suggested as indicated in states where an associated extensive protein catabolism might have raised the non-protein nitrogen to very high levels.

Within a month of the occurrence of this case another case presented itself, which is still a problem, but which is running the same course of anuria, followed by diuresis. She is now in the diuretic phase, and has passed nearly 8,000 c.c. of urine daily.

The writers wish to thank Dr. S. Hansen for his help in this case; also they wish to express their gratefulness to Drs. J. Orobko, F. Conroy, D. Wilson and W. Anderson, and last but not least, Sister Bernadette Gauthier of St. Mary's Ward, Edmonton General Hospital, whose untiring efforts played a great part in the recovery of this patient.

### REFERENCES

1. DOBBS, R. H.: *The Lancet*, **1**: 360, 1947.
2. REID, R., PENFOLD, J. B. AND JONES, R. N.: *The Lancet*, **2**: 749, 1946.
3. TRUETA, J., BARCLAY, A. E., DANIEL, P., FRANKLIN, K. J. AND PRITCHARD, M. A.: *The Lancet*, **2**: 237, 1946.
4. MUIRHEAD, E. E., HALEY, A. E., HABERMAN, S. AND HILL, J. M.: *Blood*, **3**: (Supp.), 101, 1948.

451 Birks Building.

Most of the controversy over suggested change in medical practice revolves about the desire of physicians to preserve as much freedom as possible and at the same time to serve the public with the highest grade of medical care. The most persuasive arguments for freedom in the medical profession stress the need of liberty for maintaining continued progress and quality in medicine. Both past and contemporary history afford ample evidence for the belief that, as freedom for individual initiative and creativeness disappears, the quality of service to society deteriorates. We have good reason also for believing that the loss of individual freedom lowers our moral and spiritual values.—Evan W. Thomas, *New York Medicine*, June 5, 1949.

# AIR TRAVEL FOR THE INCAPACITATED

**K. E. Dowd, M.D.**

*Chief Medical Officer, Canadian National Railways and Trans-Canada Air Lines, Montreal, Que.*

INASMUCH as our Canadian airlines are frequently requested to arrange transport for patients suffering from many types of illness, it is considered desirable that the attending physicians of such patients might be given some guiding principles covering the acceptance or rejection of such prospective passengers for air travel. Our Medical Department is frequently requested for information on this subject, not only by our own airline personnel who have been approached by the passenger or his relatives for air travel authority, but also by doctors on behalf of their patients.

Although it is obvious that the airline companies are in the business to transport passengers and thus increase their revenues, it is also rather obvious that the ability to give satisfactory medical or nursing care to an ill or disabled passenger in the modern type of aircraft presents very definite difficulties. Most commercial aircraft are not fitted to segregate an ill patient from the rest of the passengers. In effect, the acceptance of such patients means the conversion of the passenger space on the aircraft into a sick room, with the ill or injured in full view of the thirty or more other travellers. This situation is unfair to the disabled passenger, as well as his fellow travellers. Furthermore, in the acceptance of an incapacitated passenger, full consideration must be given to the safety and comfort of such a passenger and to the health, safety and comfort of other passengers travelling in the same aircraft.

Many of the effects of air travel are related to the decrease in barometric pressure which occurs at altitude. This decrease causes a reduction in the availability of oxygen in the inspired air and changes in the volume of gases within the body cavities. Under Boyle's law, any given quantity of gas varies in volume inversely in proportion to the absolute pressure on it. Thus at an altitude of 18,000 feet, although the *composition* of the air is the same, the total atmospheric pressure and the partial pressure of oxygen are reduced by approximately one-half that at sea level, while the gases have expanded to approximately twice their normal volume (or if retained in an enclosed space, the pressure of the gases is twice that found at sea level). Proportionate alterations of oxygen pressures and atmospheric volume occur at other different altitudes.

Applied to the human organism, one finds that as one ascends the reduction in the partial pressure of oxygen may cause symptoms of oxygen lack on the one hand, while the concomitant expansion of gases in the middle ear, sinuses and gastro-intestinal tract may cause symptoms in these respective organs. One finds the ear most commonly affected. On ascent the expanding air in the middle ear causes a pressure sensation and eventually this pressure becomes great enough to force the air through the Eustachian tubes, resulting in an equalization of the air in the internal ear with the outside air. During descent the barometric pressure increases, with the result that the pressure in the external ear is greater than that in the middle ear. Normally, by swallowing, the Eustachian tubes become opened and equalization of pressure is accomplished. If the traveller suffers from a severe head cold, the irritation and congestion in the throat may be sufficient to block the Eustachian passages and a condition of traumatic inflammation is super-added. Similar pressure changes occur in the paranasal sinuses as noted above. Under inflammatory conditions, such as sinusitis, blockage of the free passage of air in and out of the sinuses may occur with resulting pain on either ascent or descent. The gastro-intestinal tract is also affected. Intestinal gases expand on ascent. If relief is not obtained, due possibly to inadequate elimination, the ingestion of gas-forming foods such as cabbage, beans, etc., extreme discomfort may develop. Air in the chest cavity, as found in patients under treatment with pneumothorax, is also similarly affected regarding expansion at altitude, with resulting pressure effects on the lung and surrounding organs. The reduction in the availability of oxygen at altitude may affect the cardiovascular system and nervous system appreciably.

On the basis of these general and very brief remarks, the following short guide is submitted for consideration by our medical confrères when the question of air travel for a prospective passenger is under review.

## CIRCULATORY SYSTEM

*Heart conditions.—Valvular heart disease,* compensated, may be accepted for air travel. These cases should not fly over 10,000 feet in non-pressurized aircraft and they should be given oxygen at altitudes above 7,000 feet and preferably from the ground up. *Valvular heart disease,* uncompensated, reject for air travel.

*Coronary thrombosis.*—The acute coronary case should, of course, not be approved for air travel under any circumstances. The healed case of coronary thrombosis, which is asymptomatic, can be accepted for normal air travel. It is considered desirable that such patients should not fly within six months of the development of the heart condition. It is necessary for the air traveller to climb stairs to board the aircraft, and this fact should be kept in mind in determining the patient's fitness for flying.

*Angina pectoris.*—Cases suffering from anginal disease with recurrent pain on exertion should not travel by air because of the possibility of left ventricular failure or sudden coronary thrombosis.

*High blood pressure.*—Any case of severe high blood pressure should be advised not to travel by air. As a guide, a blood pressure higher than 185/100 would be a contraindication to long trips by air. The patient with a mild uncomplicated hypertension should offer no problem in acceptance for flying. A mild sedative prior to flight time is indicated.

## RESPIRATORY SYSTEM

Acute pharyngitis, sinusitis, and other conditions which cause congestion of the tissues of the nose and throat, may cause blockage of the Eustachian tubes and sinuses, resulting in inability to ventilate the passages and pain in flight or after descent. Usually the use of one of the vasoconstrictor drugs will cause shrinkage of the inflamed tissues with resulting satisfactory ventilation of the sinuses and middle ear, and relief of painful symptoms. However, the severe cases of "acute head cold" should be advised to delay air travel until the symptoms have subsided.

*Asthma.*—Severe cases of asthma should be advised against air travel. During an acute attack of *any* degree, the patient should not undertake air travel. The mild asthmatic may fly between attacks without difficulty.

*Tuberculosis.*—Cases of active tuberculosis should definitely be rejected for travel by air, also patients under tuberculosis treatment with pneumothorax. In the latter type of case, the increase in intrathoracic pressure may, through pressure effects on the heart, large vessels and sound lung, cause death of the patient.

Cases of *lung cancer, pulmonary abscess* and *extensive fibrosis* should be advised against air travel. Cases of *bronchitis, bronchiectasis* and *pneumoconiosis* can be accepted for air travel unless these conditions cause definite respiratory embarrassment. The administration of oxygen may be indicated at altitudes above 7,000 feet.

*Pneumonia.*—Pneumonia patients should not travel by air. If accepted because of emergency conditions, all such lung cases should be given oxygen at all times during flight to assist in maintaining normal oxygen blood levels.

## SURGICAL CONDITIONS

*Peptic ulcer cases* can be transported by air, although there is a slightly increased possibility of perforation due to increased intragastric and intraintestinal pressure because of expansion of intestinal gases at increased altitude.

*Gall bladder disease* in a passenger should not interfere with air travel.

*Colostomy cases* should not fly because of the difficulty of looking after them on the aircraft.

*Convalescent surgical cases* may be accepted for air travel provided they do not require special attention en route.

*Scrotal hernia cases* should be advised against air travel due to the possibility of complications developing at altitude as result of expansion of intestinal gases.

## BLOOD DISEASES

Cases of *anæmia,* and severe *leukæmia* in advanced stages should not travel by air because of the possibility of anoxia. If they must be carried, oxygen should be given at altitudes over 7,000 feet.

## DIABETES

Patients suffering from uncomplicated diabetes not requiring insulin in flight may be *accepted* for air travel. Inasmuch as there are no facilities carried on board to give hypodermic injections, the severe diabetic on insulin should refrain from air travel unless he carries his own equipment required for his medical care and is trained in its use.

## INTOXICANTS

The obviously intoxicated passenger should not be accepted for air travel. He can be a nuisance to fellow passengers and crew and he usually requires much more care and attention than any other passenger on board. Sound common sense suggests the definite refusal of such passengers for air travel.

The drug addict should be advised against air travel.

## NERVOUS SYSTEM

*Mental disease.*—Mentally deficient passengers of mild degree will usually be carried, subject to approval of the airline District Traffic Manager and the Company medical representative. Such passengers who are only afflicted to a minor degree may be carried without an attendant. Patients suffering from any severe psychosis should not be transported by air because of the disturbance which such a passenger might create in the aircraft and the difficulty of controlling such a patient. When air travel is considered possible in certain designated cases, such passengers will be accompanied by a qualified guard and preferably a doctor, and travel be made only on a chartered plane which carries no other passengers.

*Nervous patients.*—Those patients who are nervous and highly strung can usually be well controlled by sedation and make satisfactory passengers.

*Disease of central nervous system.*—These cases may be accepted for air travel provided they do not require assistance.

*Children and infants.*—Children and infants may be accepted for air travel at any age. The feeding of infants should be carried out while the plane is descending in order to assist in the opening of the Eustachian tubes and the prevention of possible subsequent ear trouble.

## CASES OF PREGNANCY

All cases of normal pregnancy which are not beyond the eighth month may be accepted for transportation by air on domestic, trans-oceanic and other international flights. Furthermore, for all flights, except trans-oceanic, if the woman is in the ninth or last month of pregnancy and the estimated date of birth of the baby is *not less than five days of the date of departure,* an obstetrician's certificate is required to the effect that said obstetrician has examined the woman and found her to be physically fit for transportation by air from———— to————on————and that the estimated date of the birth of the baby is————. Such certificate should be prepared in triplicate, one copy to be retained by the passenger agent at the originating station, while the second and third copies will be held by the passenger for interline use or other reference en route. If the estimated date for the birth of the baby is *within* five days of the date of departure, the woman will not be accepted for passage by our Company.

### CONTAGIOUS DISEASES

These diseases include diphtheria, scarlet fever, measles, etc., also tuberculosis (noted above). For obvious reasons prospective passengers suffering from contagious diseases must be advised against air travel.

### LOCOMOTOR SYSTEM

Passengers suffering from physical disabilities of their limbs who are able to care for themselves without any more attention or assistance from air line employees than can be expected by any ordinary able-bodied person may be recommended for air travel.

Persons suffering from any illness liable to cause annoyance or objection to other passengers will not be carried, even though they may be accompanied by an attendant.

*Blind passengers.*—Passengers with impaired vision will be carried whether or not they are accompanied by another passenger. A dog trained to lead the blind, when properly muzzled and harnessed, will be carried free of charge in the aircraft cabin when accompanied by a person with impaired vision dependent upon such dog. The dog will not be permitted to occupy a seat but must lie or stand at the feet of its master.

*Stretcher cases.*—Will be accepted for carriage in the Company's aircraft in the case of emergency only, *e.g.*, a child with a foreign body in lung who must be rushed to a large hospital centre. A qualified attendant must accompany such patient. Full details must be obtained and prior approval for travel must be given by the local air line medical representative and personnel concerned. In the majority of cases it is necessary to remove air craft seats to provide space for the stretcher, and in view of the general difficulties of rendering satisfactory care to stretcher cases, it is desired that such cases be restricted to a minimum. However, where the saving of a life is involved, the usual Company practice is substantially to disregard factors of inconvenience to other passengers and to accept the proposed passenger, providing such acceptance does not offer a threat to the safety or health of other passengers.

In reviewing the above, it may be considered that some of the suggestions made are not indicated, and this point of view may be true in their application to inter-city services. As a general rule, however, long flights by air under modern conditions frequently require delays at intervening airports because of weather conditions, also changes from one aircraft to another are sometimes necessary. The attendant difficulties, although of little significance to the normal healthy individual, impose a very definite hardship in the case of the disabled patient. It may here be noted that air line companies are not prepared to accept for travel prospective passengers in the terminal stages of illness with a view to the quick transfer of the patient to a distant point where death may occur among friends or loved ones. The difficulties and hazards incurred in endeavouring to perform this humanitarian type of service far outweigh the quite commendable but illogical desire to help these unfortunate people. We have had patients suffering from acute illness placed on our aircraft by well meaning but ill-informed relatives or friends, and sometimes on the advice of their doctors, with resulting aggravation of the condition and in some cases death of the patient in flight. Death under any circumstances is always disturbing. On trains such cases can be dealt with with much less difficulty or disturbance than on an aircraft, as the body can be removed to an adjoining compartment, baggage car or other part of the equipment. Air travel lends no such facilities.

A further note might be added in regard to the present type of aircraft in use in Canada. Many aircraft are still not pressurized and oxygen must be administered to passengers at altitudes beginning at least at 12,000 feet and over. Oxygen is available at *all* altitudes, but the administration of oxygen for long periods is still a source of discomfort and annoyance to any passenger and more so to a sick or disabled traveller. As the technical advances in the design of modern aircraft are adopted, and particularly in view of the great comfort of pressurized aircraft which are coming into wider use each year, it is anticipated that the number of medical contraindications to flying may be lessened. However, pressurized cabins will obviate only some of the precautions now necessary in the acceptance for transportation of this class of traveller. It should be stressed that air travel for the sick or disabled in even the finest pressurized commercial aircraft in which other passengers are carried still should be regarded as unsatisfactory and surrounded by difficulties which are hard to overcome.

It is also desired to call the attention of the medical profession to the use of certain antibiotics in the treatment of flight personnel. All flight personnel are subject to periodic examination and are maintained in a high degree of physical fitness. Treatment of any medical conditions which may arise is undertaken by the doctor of the employee's choice. In view of the increasing use of antibiotics, it might be worthwhile to recall that streptomycin, when administered in fairly heavy dosage, may cause disturbances in the vestibular mechanism of a prolonged temporary or possibly permanent degree, manifested by dizziness and imbalance of the individual concerned. In a pilot the development of such a condition would unfit him for further flight duty. Therefore, it is desir-

able that streptomycin should not be administered to any pilot or member of a flight crew without due regard to the possibility that, through the effects of such administration, the patient concerned may thus become totally and permanently unfit to follow his flight duty assignment. Furthermore, the use of some of the antihistamine group, such as benadryl, pyribenzamine, etc., in the control of hay fever, urticaria and other allergies is contraindicated in the treatment of flight personnel while on duty because of the side effects of drowsiness and lethargy which may ensue. In the interests of safe airline travel, it is obvious that any drug which will interfere with the full use of the pilot's physical or mental functions should not be prescribed.

59 Balfour Avenue.

RÉSUMÉ

Revue des considérations qui s'imposent quant au transport aérien des malades. Elles reposent sur deux principaux phénomènes relatifs aux hautes altitudes. D'une part, la chute de la tension barométrique détermine une augmentation relative de la tension aérienne dans la caisse du tympan, ce qui peut devenir grave s'il y a obstruction de la trompe d'Eustache. D'autre part, la tension partielle exercée par l'oxygène au niveau des alvéoles pulmonaires peut devenir insuffisante si on n'y supplée par des appareils à oxygène ou par la cabine étanche à pression atmosphérique. Parmi les états qui contre-indiquent le déplacement par avion, citons toute cardiopathie ou pneumopathie grave, l'hypertension artérielle grave, la hernie inguino-scrotale, toute anémie grave, l'ébriété, les psychoses graves et les états d'agitation, les cas de grossesse où la date probable de l'accouchement est éloignée de moins de cinq jours de la date du départ.

PAUL DE BELLEFEUILLE

## ELECTRONARCOSIS*

**J. J. Geoghegan, M.B., Ch.B.**

*Guelph, Ont.*

ELECTRONARCOSIS is considered in some places to be as good as insulin in the treatment of schizophrenia.[1 to 4] One publication on the subject emphatically states that electronarcosis is only equivalent to electro-convulsive therapy (E.C.T.) as a therapeutic measure.[5] There is such a marked difference of opinion in these preliminary reports that one wonders if we are dealing with the same procedure.

This treatment might be regarded as the natural sequence to insulin coma and E.C.T. Indeed when we consider how long insulin and E.C.T. have been used, it is a wonder that electronarcosis has been neglected for so long. Electronarcosis was first used experimentally on animals as far back as 1902, without any ill effects clinically or neurologically.[6] Various types of current were used, such as unidirectional pulse, direct and alternating currents. Little or nothing was done about it until within the last few years when American workers, after intensive and prolonged experimentation on animals with various types of currents and frequencies, were favourably impressed with the ease and safety of the procedure.[7, 8] Even after prolonged application of electric currents of high intensity, in some cases prolonged for hours, no evidence of gross or microscopic brain damage was noted. Finally, patients suffering from schizophrenia were then treated with electronarcosis with results stimulating enough to warrant its continuation.

*Selection of patients.*—This preliminary investigation deals mostly with patients suffering from schizophrenia although a few with affective conditions were also treated. Some of the patients had been treated with E.C.T. or insulin or both without response, while others had received no previous shock therapy. As this study progresses we hope to be in the position to make the following investigation on schizophrenic and other mental deviations: (1) a comparison of electronarcosis and insulin results when no previous shock therapy has been used; (2) a comparison of the results of E.C.T. failures treated with electronarcosis with E.C.T. failures treated with insulin. Some investigation has already been done on the latter at the Ontario Hospital, London, with somewhat revealing results;[9] (3) the results of insulin failures treated with electronarcosis; (4) the results of electronarcosis failures treated with insulin. We have already commenced this investigation. One electronarcosis failure recovered on insulin and two are still receiving insulin.

Our patients have been divided into two groups (*a*) those ill less than 18 months and (*b*) those ill 2 or more years. All patients receive the usual pre-shock examinations. As electronarcosis is said to be more hazardous than E.C.T. only those in good physical condition have been selected.

### TECHNIQUE

Our technique at Homewood differs in many respects from that of the other centres using the treatment, but the essential nature of the

* From the Homewood Sanitarium, Guelph, Ont.

treatment is unchanged. Our patients receive their ordinary breakfast at eight o'clock in the morning. One-half hour before treatment is administered each patient receives atropine sulphate gr. 1/100. This prevents excessive salivation during the treatment and eliminates dyspnœa and restlessness. The patient comes to the treatment room in ordinary everyday clothing, lies on a hospital bed without the usual rigid surface underneath and the spine is slightly hyper-extended over an ordinary pillow. The patient then receives an intravenous injection consisting of gr. 5 of sodium pentothal in 5 c.c. of distilled water. This injection results in immediate sleep which eliminates nervousness, facilitates the proper placement of the electrodes, to some extent buffers the initial tonic contraction and eliminates post-treatment excitement.

The electrodes are wrapped in gauze moistened with normal saline and placed three inches in front of the anterior border of the mastoid process and one and one-half inches above the zygoma. Multiple small electrical burns are common when uncovered electrodes are used. Electrogel is liberally applied to the skin underneath. Electrodes should not be placed farther back than two and one-half inches, otherwise stridor and a superficial coma will result. An ordinary air-way is placed between the patient's teeth to protect the tongue during the first stage of the treatment and facilitate respiration during the second phase.

The machine in use at Homewood is a 60 cycle AC unit equipped with a glissando unit. The pre-set current by this device takes exactly 1.2 seconds to reach its peak. The glissando in the new B.S.T. unit is of much shorter duration and accounts for the greater violence of the initial contraction and the relatively high fracture incidence. This gliding increase in the current results in a soft initial contraction and eliminates or almost eliminates compression fractures of the vertebræ. It is, therefore, possible with the patient deeply asleep to lower the pre-set current to the region of 130 milliamperes, thus eliminating the usual violent initial tonic contraction. When the treatment switch is placed in the on position the pre-set amplitude is reached in exactly 1.2 seconds, the higher the amplitude the more violent the contraction. The current is then rapidly increased manually to 300 ma. for eight seconds, lowered to 250 ma. for the next ten seconds, then to 200 ma. until the thirty second mark is reached when it is lowered to 50 ma. By this method controlled clonic contractions are almost invariably present at the twenty second mark and usually continue for ten or fifteen seconds. Violent contractions can be further controlled by increasing the current from 50 ma. to 70 to 100 ma., and at the end of the clonic phase again decreasing it to 50 ma. Respiration is usually re-established at the end of one minute when the air-way is pushed into position. A mixture of 95% oxygen and 5% carbon dioxide is then run into a respiratory mask and the patient breathes this mixture for the duration of the treatment. It has been our experience that the initial current must be high enough to stimulate clonic contractions in order to produce the narcotic type of electro-coma.

With the air-way now in position and the patient breathing freely of carbogen the second phase of the treatment commences. It is customary in most other centres to increase the current by five ma. per fifteen seconds until the onset of mild stridor and flexor rigidity of the arms. Our experience has been that the slow increase of current as used above frequently results in a restless treatment characterized by torsion movements, purposeful movements of the hands and generalized restlessness. We have found that a rapid steady increase in the current amplitude, within reason, facilitates deepening coma and the patient has no opportunity of re-awakening. At the end of two minutes, therefore, our milliammeter usually registers between 110 and 140 ma. At the end of three minutes the milliammeter registers, if necessary, between 150 and 180 ma. By this time the patient is in the electronarcosis state—legs extended, arms flexed, hands in carpo-pedal spasm, no restlessness and mild stridor. We do not consider this elevation of current harmful, in fact, we believe that it is necessary to elevate the current to at least 150 ma. to ensure a deep narcosis. Secondary grand mals are not met with, despite this high amplitude. If stridor occurs and is severe enough to interfere with the treatment the electrodes can be moved anteriorly with immediate reduction of stridor. Simultaneously there is usually some decrease in the flexor rigidity of the arms and a further increase of the current is therefore necessary to maintain deep coma. It can be said that the further forward the electrodes are placed the

higher will be the current necessary to ensure an adequate narcosis. The current is maintained at the required level for eight or ten minutes when it is gradually decreased to zero and the treatment is at an end. The progress of the patient thereafter is similar to that of the E.C.T. treated patient.

When the treatment is administered to a patient who has not been atropinized, respiration is continuously impeded by excessive salivation. This can be adequately taken care of by a suitable suction apparatus, but the frequent application of this apparatus naturally deprives the patient of a large amount of $CO_2$ and oxygen. Atropine administered to the patient one-half hour before the treatment almost entirely eliminates this troublesome feature of the treatment.

At the commencement it is customary to give the patient three electronarcosis treatments per week. In some centres it has been recommended that the treatments be continued until the patient has had 20, 30 or 40 comas, as is usually the case with insulin-treated patients. Others recommend that the treatment be continued until the patient shows improvement when the treatments are given twice weekly for two weeks and then once during the last week of treatment. For the first two months we continued the treatments until the patient had received 30 comas. It soon became evident, however, that patients responding to electronarcosis usually did so, as is the case with E.C.T., from about the sixth to the fifteenth treatment. In other words, at this early date of our investigation, we are inclined to believe that most of those schizophrenic patients who will respond to electronarcosis will do so with the first ten treatments and that the remainder will probably respond when they have received about fifteen or twenty treatments. When the patient has shown marked clinical improvement electronarcosis is given twice a week for one or two weeks and then one final treatment. We have also decreased the duration of these latter treatments to five minutes. This is then followed by a period of two or three weeks' observation when the disposal of the patient is then considered. Most patients who have not responded satisfactorily to the fifteenth or twentieth treatment will not, in our opinion, respond to a larger number. A longer period of time, however, will be necessary before this conclusion can be made with certitude.

The duration of each treatment is arbitrary. Most centres prolong the treatment to seven, eight or twelve minutes. At the commencement of the investigation we followed this closely, but within a short time we gradually extended the duration to fifteen minutes. In two cases, both showing no improvement to intensive electronarcosis, the duration was extended to one hour and three hours respectively. Neither untoward nor beneficial effects were noted. We noticed that when we limited the duration of the treatment to seven, eight or ten minutes we had little or no post-treatment confusion or amnesia. When, however, the treatment was extended to fifteen minutes there was a marked increase in the incidence of memory disturbance and confusion, particularly the latter. We have, therefore, shortened our treatments to eight minutes.

*Types of electronarcosis.*—Two types of reaction have been described. One is called the "narcotic type" and the other the "hyperkinetic type". The former has been more common in our experience, particularly when the patient has shown definite clonic contractions at the end of the first thirty seconds. The patient lies quietly with legs extended, arms flexed, no cyanosis and little or no stridor. When clonic contractions have not been elicited the patient usually becomes restless about the fourth or fifth minute. This restlessness manifests itself by torsion and purposeful movements, respiratory difficulty and noisiness. In such cases we have found it beneficial to manually sweep the current up to 300 ma. for a period of fifteen seconds and gradually return it to its former level. A second grand mal usually results from this procedure and a quiet narcotic treatment may be effected. In some cases, particularly in those who have not responded after the twentieth treatment, we have terminated further treatments with a second grand mal. We have not, however, noted any beneficial results from this procedure.

*Clinical findings.*—During the first thirty seconds of the treatment most patients showed marked irregularities of heart action-cessation, bradycardia or tachycardia. This was usually associated with changes in blood pressure. Blood pressure readings taken during the first phase were difficult to estimate because of muscular tension and adventitious sounds. When the current was dropped to 50 ma. and from then on for the duration of the treatment, all patients showed marked tachycardia with elevation of blood pressure. This elevation

was present in both systolic and diastolic readings. Pilomotor reaction such as flushing of the skin, sweating, etc., were also almost universally met with. These findings have all been fully recorded in other reports.[10] Electro-coma appears to be deepest immediately following the clonic phase when neurological phenomena are common, *e.g.*, positive Babinski. Coma in the second phase never reaches the degree commonly met with in insulin therapy. Patients awaken from two to thirty-five minutes after the treatment is discontinued.

### COMPLICATIONS

(*a*) *Fractures.*—In approximately 600 electronarcosis treatments we have had no clinical evidence of compression fractures of vertebræ. We have not, however, carried out post-treatment x-rays on any of our electronarcosis patients as none of them complained of backache. This is unquestionably the result of the special glissando technique, deep sedation of the patient and the low initial milliamperage.[11] Fractures of other bony structures were not encountered.

(*b*) *Memory disturbance.*—Memory disturbance, disorientation and confusion are not more common with electronarcosis than with electrotherapy, when the classical method is used. Post-treatment excitement occurred in one patient. Amnesia and confusion are, however, more commonly met with following electronarcosis than when B.S.T. is used. The majority of our patients showed a mild degree of nominal aphasia, but no gross amnesia or confusion on treatments of eight minutes' duration. Treatments of fifteen minutes' duration or longer were complicated by gross memory disturbance and confusion in about half our cases. With few exceptions patients were not incapacitated to any extent after electronarcosis and the majority were able to participate in the regular occupational and recreational programs in the afternoon and evenings.

### RESULTS

Sixteen patients ill less than eighteen months received electronarcosis. Seven of them had no previous shock therapy. The results are shown in Table 1A. It will be noted that two patients recovered, three were much improved, one was improved and one unimproved.

Of the nine remaining patients seven were E.C.T. failures, one was an insulin and E.C.T. failure and one responded to metrazol six years ago. The results are shown in Table IB.

TABLE IA.

SCHIZOPHRENIC PATIENTS ILL LESS THAN 18 MONTHS
NO PREVIOUS SHOCK THERAPY

| *Name* | *Age* | *Diagnosis* | *Duration in months* | *No. E.N.* | *Result* |
|---|---|---|---|---|---|
| Miss H. | 29 | Catatonic | 4 | 12 | 1 |
| Mrs. H. | 47 | Paranoid | 8 | 15 | 2 |
| Miss C. | 29 | P. | 4 | 23 | 3 |
| Miss G. | 26 | C. | 2 | 10 | 2 |
| Mrs. J. | 43 | P. | 18 | 24 | 4 |
| Mr. S. | 23 | P. | 4 | 24 | 1 |
| Mr. C. | 31 | P. | 4 | 4 | 2 |

*Legend*

1 = recovered
2 = much improved
3 = improved
4 = unimproved

TABLE IB.

SCHIZOPHRENIC PATIENTS UNIMPROVED WITH PREVIOUS SHOCK THERAPY
(E.C.T., INSULIN)

| *Name* | *Age* | *Diagnosis* | *Duration* | *Shock results* | *No. E.N.* | *Result* |
|---|---|---|---|---|---|---|
| Mrs. McK. | 32 | C. | 16 | 4 | 31 | 4 |
| Miss P. | 19 | P. | 18 | 4 | 16 | 1 |
| Miss R. | 23 | C. | 6 | 4 | 16 | 4 |
| Mrs. R. | 37 | P. | 5 | 4 | 14 | 2 |
| Mrs. B. | 45 | C. | 4 | 4 | 15 | 2 |
| Mr. K. | 26 | C. | 16 | 4 | 27 | 4 |
| Mr. P. | 30 | P. | 5 | 4 | 10 | 3 |
| Miss B. | 39 | P. | 6 | 4 | 30 | 4 |
| Mr. S. | 42 | P. | 2 | 1 | 8 | 1 |

Two of the nine recovered, two were much improved, one was improved and four were unimproved.

The total immediate results are shown in Table IC.

TABLE IC.

| *Diagnosis* | *No. patients* | *Results* 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Paranoid schizophrenic... | 10 | 3 | 3 | 2 | 2 |
| Catatonic schizophrenic.. | 6 | 1 | 2 | – | 3 |
| Total..... | 16 | 4 | 5 | 2 | 5 |

Nine of the sixteen patients recovered or were much improved, the remainder are still in hospital.

Our second group of schizophrenic patients have been ill two or more years. The results are shown in Table II.

TABLE II.

SCHIZOPHRENIC PATIENTS ILL LONGER THAN 2 YEARS

| *Name* | *Age* | *Diagnosis* | *Duration in years* | *Previous treatment and results* | *E.N.* | *Result* |
|---|---|---|---|---|---|---|
| Miss B..... | 37 | P. | 3 | E.C.T. Insul. = 4 | 23 | 4 |
| Mrs. B..... | 55 | I.P. | 2 | E.C.T. = 4 | 30 | 4 |
| Miss C..... | 43 | C. | 20 | E.C.T. = 4 | 30 | 3 |
| Miss N..... | 36 | H. | 10 | E.C.T. = 4 | 30 | 4 |
| Miss P..... | 19 | H. | 2 | E.C.T. = 4 | 26 | 4 |
| Miss P..... | 22 | P. | 3 | E.C.T. Insul. = 4 | 23 | 4 |
| Mrs. L..... | 41 | C. | 10 | Met. E.C.T. Insul. = 4 | 25 | 4 |
| Mr. B..... | 37 | C. | 7 | E.C.T. Insul. = 4 | 39 | 3 |
| Mr. B..... | 17 | C. | 2 | E.C.T. = 4 | 29 | 4 |
| Mr. M..... | 26 | C. | 3 | Nil | 25 | 2 |
| Mr. McL..... | 47 | P. | 9 | Nil | 36 | 4 |
| Mrs. McC..... | 31 | P. | 15 | Nil | | 2 |
| Mrs. D..... | 33 | P. | 4 | E.C.T. Insul. = 4 | 26 | 4 |
| Mrs. J..... | 47 | P. | 4 | Nil | 26 | 4 |
| Mr. S..... | 34 | P. | 4 | E.C.T. + Insulin. = 2 | 6 | 2 |

TABLE III.

| *Name* | *Age* | *Diagnosis* | *Duration* | *E.C.T. results* | *No. E.N.* | *Result* |
|---|---|---|---|---|---|---|
| Mrs. W..... | 58 | Involl. melan. | 12 months | 4 | 28 | 4 |
| Mrs. A..... | 51 | Involl. melan. | 15 months | 4 | 11 | 2 |
| Mr. T..... | 58 | Involl. melan. | 8 months | 4 | 14 | 4 |
| Mrs. Y..... | 38 | Par. state | 6 months | 4 | 6 | 1 |
| Mr. J..... | 57 | Manic with schiz.-affect. | 2 months | 4 | 6 | 1 |

Of the fifteen treated three were much improved, two improved and ten unimproved.

A small group of five patients with affective conditions not responding to E.C.T. received electronarcosis. The results are shown in Table III.

## CONCLUSIONS

The following tentative conclusions have been arrived at after five months' experience with electronarcosis on a small group of patients:

1. Electronarcosis is not specific for schizophrenia, but it is a valuable addition to the physical therapies.

2. Electronarcosis, because of its economy, safety and encouraging results deserves further intensive investigation, particularly in early schizophrenia.

3. The course of the long-standing schizophrenic disorder is not influenced to any noticeable degree by electronarcosis.

4. Patients with other mental conditions not responding to E.C.T. should have electronarcosis therapy.

5. Schizophrenic patients who respond to electronarcosis usually do so between the sixth and fifteenth treatments. This was found to be the usual state of affairs with E.C.T. Patients who do not recover by the fifteenth or twentieth treatment do not benefit by prolonging electronarcosis.

6. Schizophrenic patients who do not respond to electronarcosis should have the benefit of insulin therapy.

7. Patients who do not respond to E.C.T. or insulin are more resistant to electronarcosis. This was found to be the case with E.C.T. failures treated with insulin.

8. No clinical evidence of compression or other fractures was noted with the procedure

described. Electro-convulsive therapy, with classical and brief stimulus techniques, is now given by this technique.

9. Twelve to fifteen electronarcosis treatments and an equal number of shock treatments can be given in three hours by one physician, one graduate nurse and two attendants. A small number of insulin patients can also be supervised during this period.

10. Electronarcosis is as safe as E.C.T. and safer than insulin therapy.

I would like to express appreciation to Dr. F. H. C. Baugh for his interest and permission to publish this paper, also to Dr. A. L. McKinnon, Dr. G. S. Burton and Dr. M. Bunt for their co-operation in preparing the case material.

REFERENCES

1. VAN HARREVELD, A. AND WIERSMA, C. A. G.: *Am. J. Physiol.*, **10**: No. 6, 1944-45.
2. TIETZ, E. B.: *J. Nerv. & Ment. Dis.*, **106**: No. 2, August, 1947.
3. MEDLICOTT, R. W.: *New Zealand M. J.*, **46**: No. 254, p. 280 .
4. PATERSON, A. S. AND MILLIGAN, N. L.: *The Lancet*, p. 198, August 9, 1947.
5. BOWMAN, K. M. AND SIMON, A.: *Am. J. Physiol.*, **105**: 15, 1948.
6. LEDUC, C.: *Acad. de Sci. Paris*, **135**: 199 and 878, 1902.
7. VAN HARREVELD, A. AND WIERSMA, C. A. G.: *Am. J. Physiol.*, **139**: 171, 1943.
8. *Idem*: *J. Neuropath. & Exper. Neurol.*, **2**: 263, 1943.
9. GEOGHEGAN, J. J.: *Canad. M. A. J.*, **56**: 15, 1947.
10. MEDLICOTT, R. W.: (see number 3 above).
11. BOWMAN, K. M. AND SIMON, A.: (see number 5 above).

RÉSUMÉ

L'auteur rapporte environ 600 séances d'électronarcose, les malades étant pour la plupart schizophrènes. Il administre le traitement au moyen de deux électrodes temporales. Un courant maximum de 300 milliampères permet d'abord de déclencher la crise clonique; on diminue alors l'intensité à 50 milliampères. Une fois la respiration rétablie, on maintient l'état d'électro-coma, pendant huit minutes, par un courant de 110 à 180 milliampères. Au début du traitement, le malade est anesthésié par l'injection intra-veineuse de 30 centigrammes de Pentothal sodique; une demi-heure auparavant, on lui a donné 1/100 de grain d'atropine. Ce traitement n'a pas causé de fractures dans les cas rapportés ici. Les états amnésiques et confusionnels qui suivant le traitement sont de peu d'importance et de durée, pourvu que celui-ci ne dure que 8 minutes. L'électro-coma peut s'accompagner d'arrhythmie cardiaque, d'hypertension artérielle, de vasodilatation cutanée, de transpiration et de signes neurologiques transitoires (Babinski, etc.). Le malade se réveille dans un délai de 2 à 35 minutes après la fin du traitement. Celui-ci n'est efficace que dans un certain nombre de cas de schizophrénie dont le début remonte à moins de 18 mois; quelques-uns de ceux-ci ont réagi favorablement à l'électro-narcose après avoir résisté à l'électro-choc. Par ailleurs, s'ils ont également résisté au choc insulinque, il n'est pas probable qu'ils se trouvent bien de l'électro-narcose. Cependant, les malades qui ont résisté à celle-ci pourront bénéficier du traitement par l'insuline.

PAUL DE BELLEFEUILLE

## BASIC PRINCIPLES OF PÆDIATRIC ANÆSTHESIA*

**C. R. Stephen, M.D.C.M., D.A. and H. M. Slater, M.D.**

*Montreal, Que.*

ANÆSTHESIA for infants and children does not differ radically from that in adults, as far as choice of agents is concerned: but there are several factors in technique which require special consideration. Constantly in the back of the mind of the anæsthetist is lurking the thought that the margin of safety in the child is much narrower than in the adult. Potent anæsthetic agents will snuff out life much more rapidly, respirations can be depressed with greater despatch, and the cells of the cerebral cortex can tolerate anoxia for a much shorter period. At the same time, one never ceases to wonder at the extent of surgery which these small bundles of humanity can withstand.

No matter what the agent or technique employed, one must always ensure that adequate oxygenation is maintained. The child should always receive 20% oxygen in the inhaled atmosphere, and preferably 25% or more. It is not enough merely to administer this adequate oxygen percentage: one must at all times be sure that the airway is completely patent so that the required oxygen will reach the alveoli and blood stream. Proper holding of the jaw will often be sufficient to preserve this airway, but frequently one requires the assistance of a pharyngeal airway or an endotracheal tube. Any degree of obstruction will produce a partial hypoxia.

The next important factor is that one should at all times avoid an increase of carbon dioxide in the system, for such an occurrence will speed the rapidity of breathing, will raise the blood pressure and pulse, and will produce a respiratory acidosis. This results in increased bleeding, a lessening of the reserve of the child, and strains the regulating mechanisms of acid-base balance in the body. One of the great factors leading to increased carbon dioxide in the system is the amount of rebreathing which a child is allowed to do. Even under an open drop mask, carbon dioxide will accumulate

* Presented at the Fall Meeting of the Montreal Medico-Chirurgical Society, October 21, 1948.

From the Children's Memorial Hospital, Montreal, and the Department of Anæsthesia, McGill University.

fairly rapidly. This can be avoided by raising the mask off the face every few moments for several breaths; or the carbon dioxide can be blown off by running 2 to 3 litres of oxygen under the mask. A small face-mask contains upwards of 250 c.c. of dead space, and the danger of carbon dioxide build-up in this instance can only be avoided by running high flows of gases which will tend to keep the carbon dioxide constantly blown off.

Of great importance also in children is the fact that resistance to breathing, both inspiration and expiration, must be at a minimum. In modern gas machines there is always a certain amount of resistance which the adult can overcome without difficulty; but small children subjected to the same resistance easily become fatigued. Their respiratory muscles tire, they begin to breathe more rapidly and at the end of the operation they correspond to the individual who has run a long and desperate race.

Finally, special care must be taken in children to preserve a proper fluid balance during operation. It is just as important not to overload the circulation as it is to supply adequate replacements for the fluid lost. In all children under 2 years undergoing surgical procedures of any severity, it is a wise precaution to administer whole blood to replace that which is lost during the operation. A warning should be given concerning the undue administration of saline. The child's kidney is much less capable of dealing adequately with the excess amounts of saline than is the adult's. Overabundance of saline will produce water-logging of the tissues and early œdema. At the same time the water reserve of the child is less than that of an adult, and so he will more easily become dehydrated. When a child needs fluid, the solution of choice is believed to be 5% dextrose in water, provided there is no anæmia and the plasma volume is within normal limits. In a child receiving intravenous therapy, a rule of thumb which may be used as a guide is that 75 c.c. of fluid may be given for every pound of body weight over the 24 hour period. Special care must be taken not to give large amounts over short periods.

## PREMEDICATION

The impressions which a child receives during his first sojourn in the hospital usually remain with him for the rest of his life. Therefore it is necessary that these impressions should be as pleasant as possible. We believe that the child should be admitted to hospital at least 24 hours before operation so that he may become accustomed to his surroundings. The question of premedication in children to lessen psychic trauma and reduce apprehension, is one on which all anæsthetists do not agree. However, in this hospital all children over 4 or 5 monhs of age are given an injection of morphine and scopolamine one hour preoperatively, according to the schedule laid down on the accompanying sheet (Table I). We are convinced that this allays fear and renders the patient more placid on arrival in the operating room. A particularly nervous child or one who is scheduled for spinal analgesia, is usually given in addition a dose of nembutal or seconal by mouth or rectum. The scopolamine is most effective in drying secretions, in reducing the tendency to spasm during induction, and in a synergistic way promoting the sedative effect of the morphine. Morphine is omitted in

TABLE I.
PREMEDICATION

| *Age* | *Weight* | *Morphine with* gr. | *Scopolamine or* gr. | *Atropine* gr. |
|---|---|---|---|---|
| Up to 2 months | 7 – 10 lb. | ..... | 1/600 | 1/400 |
| 2 – 3 months | 10 – 12 lb. | ..... | 1/600 | 1/400 |
| 3 – 4 months | 12 – 14 lb. | ..... | 1/600 | 1/400 |
| 4 – 7 months | 14 – 16 lb. | 1/144 | 1/600 | 1/400 |
| 7 – 11 months | 16 – 19 lb. | 1/120 | 1/600 | 1/400 |
| 11 – 18 months | 19 – 24 lb. | 1/108 | 1/600 | 1/400 |
| 18 months to 2 years | 24 – 27 lb. | 1/72 | 1/450 | 1/300 |
| 2 – 3 years | 27 – 30 lb. | 1/60 | 1/450 | 1/300 |
| 3 – 5 years | 30 – 40 lb. | 1/48 | 1/450 | 1/300 |
| 5 – 8 years | 40 – 55 lb. | 1/36 | 1/300 | 1/200 |
| 8 – 10 years | 55 – 65 lb. | 1/24 | 1/300 | 1/200 |
| 10 – 12 years | 65 – 80 lb. | 1/18 | 1/200 | 1/100 |
| 12 – 14 years | 80 – 90 lb. | 1/12 | 1/150 | 1/75 |
| Adult | 90 lb. and up | 1/8 – 1/4 | 1/150 – 1/100 | 1/75 |

infants under four months because of its depressant effect on respiration.

One potent objection to premedication is that the child must have a needle pushed into him. It is of interest to note that the hypospray, an instrument whereby subcutaneous or intramuscular injections can be performed painlessly, will be available for use within 2 to 3 months. It holds promise of being a great boon in all phases of pædiatrics.

### INDUCTION OF ANÆSTHESIA

In keeping with the ideal of avoiding any noxious impressions of hospitalization, induction of anæsthesia should be pleasant and devoid of force. This is not always easy. But if one can establish a liaison with the child, drawing him into conversation about his home or school life, *i.e.*, familiar environments, he will often drop off to sleep without fear or struggling. Nitrous oxide is a particularly good agent for induction. It is an odourless gas and because it is one and a half times as heavy as air, induction can be commenced with the mask raised well off the face. By the time the mask is gradually lowered to cover the mouth, the patient is asleep.

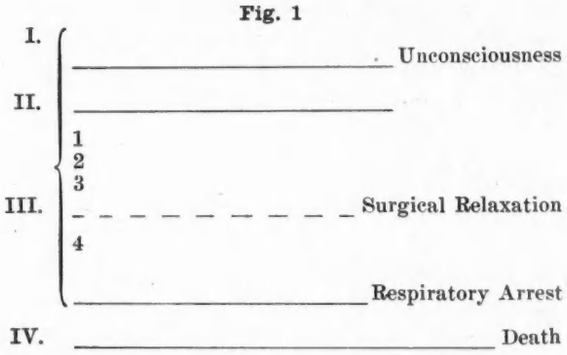
Vinyl ether, or vinethene, is a very potent and yet relatively safe agent which is used commonly for induction. Its odour is not especially unpleasant, and usually 3 or 4 good breaths will render a patient unconscious. It is thought to be definitely superior to ethyl chloride, which is not as safe because of its narrow margin between respiratory arrest and cardiac arrest.

In older children induction with pentothal or kemithal, a similar rapid-acting barbiturate, is frequent. Patients coming repeatedly to the operating room often prefer this method of induction.

*Ether.*—Ethyl ether is still the safest anæsthetic known. Perhaps one can explain this by a glance at the accompanying chart (Fig 1). With ether surgical relaxation is reached in the third plane of the third stage of anæsthesia when respiratory exchange is adequate and the patient is still at an intermediate station on his journey between unconsciousness and death. Even if anæsthesia is carried to respiratory arrest, there still remains a sizable interval before cardiac arrest occurs and death ensues. This happy combination of factors is not present with other agents when used singly.

On the other hand, one should remember that ether tends to produce an acidosis, temporarily depresses liver function, is responsible for an

Fig. 1




oliguria, and causes nausea and vomiting in about 60% of the patients in whom it is used. Its explosive properties, when used with oxygen, should not be forgotten.

*Nitrous oxide.*—Nitrous oxide is a most valuable agent in pædiatric anæsthesia, providing one is aware of and does not abuse its limitations. It is one of the weakest anæsthetics known, but at the same time is a potent analgesic. Used alone with adequate oxygen one can rarely get below the second stage of anæsthesia. By itself it is not capable of producing surgical relaxation. Its value lies in the fact that it disturbs the body metabolism less than any other agent, and that it serves as a powerful analgesic force when used in combination with other agents.

*Cyclopropane.* — This agent, discovered by Lucas and Henderson in Toronto, is probably used more frequently in adults than in children. Economy limits its use to the closed absorption technique, except in the smallest infants, and this closed absorption technique has disadvantages in children, as will be explained later. It is a powerful respiratory depressant, and surgical relaxation is obtained relatively close to the end of the journey described above. However, children tolerate this agent well, and it is usually the agent of choice in intrathoracic procedures where respirations can be artificially aided by the anæsthetist.

It should be borne in mind that cardiac arrhythmias are not infrequent with this agent when it is used in too high a concentration. Adrenalin should never be injected when a patient is anæsthetized with cyclopropane, for this in a large percentage of cases leads to

ventricular tachycardia, which goes on to ventricular fibrillation and cardiac arrest. With this agent also, one should not forget its explosive properties.

*I. V. Barbiturates.* — If properly handled, there is no contraindication to the use of pentothal or kemithal in children. It should be emphasized, however, that these agents are primarily hypnotics and only exert an analgesic effect by virtue of the depth of hypnosis induced. For this reason they should be used only in combination with analgesic agents, such as nitrous oxide and cyclopropane, or with some type of regional analgesia. In this hospital pentothal is used in 2.5% solution. Any tendency to depression of respiration, which leads to anoxia and carbon dioxide build-up, is counteracted by manual supplementation of respirations.

### TECHNIQUES OF ADMINISTRATION

As ether is one of the safest and widely used anæsthetics in children, so the vaporization and inhalation of this agent through the medium of some type of mask has been one of the commonest methods of administration. When this technique is chosen, it is of benefit to run a flow of 2 to 3 litres of oxygen under the mask by means of a mouth hook. This lessens the danger of hypoxia developing and also tends to blow off the carbon dioxide which may accumulate beneath the mask.

With this or any other method, preservation of a patent non-obstructed air passage is most essential for the well-being of the patient. Difficulty in maintaining an adequate airway over the passing years has led to the introduction and frequent use of the endotracheal tube. The advantages of endotracheal intubation are several: (1) An adequate patent airway is assured at all times. (2) Operations in the region of the head and neck can be conducted with perfect safety to the patient. (3) The tracheo-bronchial tree may be suctioned out with ease at any time. (4) Patients may be carried in lighter and more even planes of anæsthesia because the danger of laryngospasm resulting from potent surgical stimuli is eliminated. This is especially true in intra-abdominal procedures. (5) It allows adequate control of lung ventilation during intra-thoracic procedures.

The disadvantages of endotracheal intubation in children are the occasional hoarseness and laryngeal œdema which are seen post-operatively. It is believed that these complications are due largely to trauma of intubation and to coughing or bucking on the tube after it is inserted. These occurrences can be largely overcome by waiting until the patient is well anæsthetized before proceeding to intubate. In the last fiscal year at this hospital 48% or 1,363 children coming to the operating room were intubated. Of this number, 6 developed acute laryngitis, and 6 developed œdema of the glottis postoperatively. One of these patients required tracheotomy. In the same period, during which 2,756 anæsthetics were administered, only 2 patients developed postoperative pneumonia. We believe firmly that the advantages of intubation outweigh the disadvantages.

Before leaving this subject one should mention the vinyl plastic portex endotracheal tube which was developed during the war, in England. This is a flexible tube which moulds easily at body temperature without sacrificing its lumen. It does not kink easily and we believe is less prone to cause trauma and post-operative complications than the more prevalent rubber tubes.

Procedures employing the gas machine are used frequently in children. The closed carbon dioxide absorption technique should be used with caution under 6 years of age and only in special circumstances under 4 years of age, because the amount of resistance in the system is more than the child can tolerate without undue fatigue developing. A partial rebreathing system has little resistance for the child to overcome, but unless large flows of gases are used (5 to 8 litres per minute) carbon dioxide will build up in the system, to the detriment of the patient. A non-rebreathing system has been evolved at this hospital which is believed to maintain the patient as close as possible to the physiological normal. The gases flow into a reservoir bag and between this and the endotracheal tube are two valves arranged in such a way that the patient can inspire only from the bag, and his expirations are blown off into the atmosphere. The valves are rubber and of such a construction that they provide minimal resistance in the circuit. It is virtually impossible to accumulate any carbon dioxide as the

dead space is reduced to a very small amount. Babies a few days old have been anæsthetized for 2 to 3 hours using such a system without undue fatigue. Nitrous oxide and oxygen in a 75:25 ratio, with small added amounts of ether vapour, are the agents used with this non-rebreathing technique. If no machine is at hand, a draw-over system using a Flagg ether bottle is efficient in maintaining anæsthesia.

### Rectal Anæsthesia

Avertin and pentothal by rectum are used not infrequently for "basal anæsthesia" by which is meant a condition of unconsciousness usually induced prior to the patient coming to the operating room. This type of anæsthesia has much to recommend it in pleasantness from the patient's viewpoint, but it is not devoid of danger. A given dose of agent may have too profound an effect, with consequent respiratory depression or obstruction developing. Moreover, many patients receiving basal anæsthesia sleep for considerable periods following operation, thus requiring most careful watching. In selected cases basal anæsthesia may be of extreme value.

### Spinal Analgesia

The use of spinal analgesia in children is not without danger, but occasionally it becomes a method of choice. Within the past year in this hospital a series of some 125 cases have been anæsthetized using dilute hypobaric pontocaine solution, in which 1 c.c. of solution contains 1 mgm. of pontocaine. The dosage used is ½ mgm. per year of age and the technique is that of Etherington-Wilson, somewhat modified. To date the results with this dilute agent have been most satisfactory, but the investigation is not yet sufficiently complete to say whether this is a technique which is safe under all circumstances. In order to avoid unnecessary psychic trauma, patients are usually kept asleep during the operative procedure with nitrous oxide or small amounts of an intravenous barbiturate.

There is no definite contraindication to the use of other regional procedures in the child, if they are to be of benefit. For example, brachial blocks, caudal blocks, stellate blocks, lumbar sympathetic blocks and others are performed when the occasion arises.

### Curare

The introduction of curare into clinical anæsthesia by Dr. H. Griffith, of Montreal, is proving to be one of the great advances of modern anæsthesia. Indications for its use in children are not as many as in adults, but it is most effective in producing muscle relaxation when required. It is safe, providing one has adequate means of artificial ventilation at hand. As a guide for dosage in children, one may use 0.5 unit per pound of body weight. If it is used in conjunction with ether anæsthesia, the total dose must be reduced by two-thirds. The reason for this is that ether itself exerts a direct paralyzing effect at the myoneural junction.

*Anæsthesia for tonsillectomy and adenoidectomy.*—It has been stated that the administration of an anæsthetic should never be considered a minor procedure. This point should certainly be emphasized as far as anæsthesia for tonsillectomy and adenoidectomy is concerned. This is probably the commonest operative procedure in children, and yet one which is fraught with great dangers from the anæsthetic viewpoint. The maintenance of a smooth plane of anæsthesia, the avoidance of aspiration of blood, with its deleterious postoperative complications, and the preservation of a well-oxygenated patient can only be accomplished with certainty by means of an endotracheal tube. The anæsthetic agent is of lesser importance, but it is the practice here to induce the patients with open drop vinethene followed by ether. After intubation they are carried on nitrous oxide-oxygen and ether from the machine or on ether and air using the Flagg bottle. This latter is a convenient method where all facilities are not available. The non-rebreathing valve as described earlier is used to avoid rebreathing. The otolaryngologist soon becomes used to the presence of the tube and does not find it in his way.

*Anæsthesia for intra-abdominal procedures.*—There are many methods and agents which may be employed for these operations. Muscular relaxation is a necessity for the surgeon, and may be achieved in several ways. Open drop ether anæsthesia is widely employed and is satisfactory. However, in the severely ill, toxic, dehydrated patient, with acetone in the urine, large amounts of ether will tend to increase the dehydration and tendency to acido-

sis. In such cases, the amount of ether used can be reduced by intubating the patient and carrying him on nitrous oxide, oxygen and ether, using the non-rebreathing valve. The nitrous oxide assists materially in promoting analgesia and the intubation allows one to supply adequate relaxation in a lighter plane of anæsthesia. Good operating conditions can also be obtained by using a combination of pentothal, nitrous oxide, oxygen and curare, or by using cyclopropane, with curare added if required. At times spinal anæsthesia is the method of choice.

*Anæsthesia for recent fractures.*—This is a condition which frequently requires treatment in children, and again is one which may be handled in several ways by the anæsthetist. It is important to know how long before the accident the child had a full meal. For it is well-established that the functions of digestion almost invariably cease at the time of trauma. Full stomachs have been found as long as nine hours after the accident. If it is suspected that the child has a full stomach, the hazards of anæsthesia are increased considerably. In such cases the method of choice is probably some type of regional block which may be given while the child is heavily sedated or asleep with nitrous oxide. Alternatively, the stomach may be washed out before anæsthesia, or anæsthesia may be rapidly induced and the patient intubated to avoid possible aspiration of vomitus.

Nitrous oxide alone seldom provides sufficient relaxation to reduce fractures, and should be supplemented with an intravenous barbiturate or small amounts of ether.

*Anæsthesia for hare-lips and cleft palates.*—Endotracheal intubation in these cases is essential for the same reasons as outlined in discussing tonsillectomies. They can be carried in a light plane of anæsthesia and kept close to the physiological normal using the non-rebreathing valve, with nitrous oxide-oxygen and small amounts of ether as agents.

*Anæsthesia for dental extractions.*—The use of nitrous oxide alone for dental extractions in children has not been satisfactory because adequate analgesia has been obtained only by reducing the oxygen concentration to dangerously low levels. In the quest for a supplementary agent from which the patient would recover rapidly without ill effect, our attention was directed to the anæsthetic, trichlorethylene, which has been employed for several years in England. This is a potent drug, producing a high degree of analgesia in low concentrations. When used as an adjunct to nitrous oxide, the patients are effectively anæsthetized without suffering from oxygen lack, and at the same time recover quickly and quietly from the procedure. Trichlorethylene, or trilene as it is called, is a liquid with a sweet chloroform-like odour, and may be substituted for ether in the bottles provided on the gas machines. One must emphasize strongly that this agent should never be used in a carbon dioxide absorption system, for the drug reacts chemically with the soda lime to produce a compound which may cause permanent neurologic damage or death to the patient.

*Anæsthesia for infant surgery.*—Included in this group are operations for pyloric stenosis, tracheo-œsophageal fistula, congenital bowel obstruction, diaphragmatic hernia, and congenital cystic disease of the lung. It is felt that the child less than one month old is not as sensitive to painful stimuli as older children, and thus requires less anæsthesia to produce satisfactory operating conditions. For this reason most of these infants can be carried adequately on nitrous oxide-oxygen in a 75:25 ratio with traces of ether added. While more control of the situation is possible if an endotracheal tube is in place, this is not always necessary.

*Anæsthesia for intrathoracic surgery.*—Operations for congenital cardiac defects and for lobectomy and pneumonectomy are becoming more frequent. These are major anæsthetic problems which in this hospital have been handled for some years by the use of cyclopropane and oxygen in the closed to-and-fro absorption circuit. Absorption canisters are used which approximate the tidal volume of the patient and these are changed frequently (every 10 to 20 minutes) to avoid any carbon dioxide accumulation. It is usual to mechanically aid and support the patient's respirations during the procedure. This increases their oxygen exchange, makes the process of respiration less fatiguing for them, and improves operating conditions for the surgeons by lessening the vigour of diaphragmatic movements. More recently a continuous drip of 0.2% procaine has been used in the belief that it may render

the cardiac musculature less irritable to abnormal stimuli. To date we have not been convinced of its value in the dilution used.

### OXYGEN THERAPY

Finally, a word should be said concerning postoperative oxygen therapy in the wards. Since the introduction of the Beckman Oxygen Analyser, it has been possible to determine easily and quickly the exact oxygen percentage of any desired atmosphere. As a result, it has been shown repeatedly that in oxygen tents it is rare to find an oxygen percentage above 45%. This may be due to the relatively large space in the tent, to inefficient utilization, or to the fact that it is necessary to open the tent frequently. If a tent is used, a flow of at least 10 litres per minute must be used, and the tent interfered with as little as possible.

On the other hand the small plastic tent for infants is of considerable value. If flows of 8 to 10 litres per minute are used, and if the edges are properly packed, percentages of 80 to 90 are commonly found. Ice should not be used in these small tents, as the infant's temperature is usually low on return from the operating room, and there is no advantage in breathing cold oxygen. Proper humidification is obtained during passage from the tank to the tent.

In older children the naso-pharyngeal catheter is found to be quite useful. An ordinary urethral catheter with several holes in the end is placed in the nose a distance which is measured from the tip of the patient's nose to the tragus of his ear. If he tends to swallow on the catheter after it is introduced, it is withdrawn slightly. Before insertion the tube is coated liberally with nupercaine ointment. The children tolerate these catheters without discomfort. A flow of 3 to 5 litres per minute provides 60 to 70% oxygen in the inhaled atmosphere.

---

In 2,000 years, there will be "standing room only" on earth if the population continues to increase at the present rate of about 2,000,000 a month. Dr. Brock Chisholm, director general of the World Health Organization, made this prediction at the meeting of the American Association for the Advancement of Science.

## ALBERTA'S TUBERCULOSIS PROGRAM*

**A. H. Baker, B.A., M.B.**

*Medical Superintendent and Director of Division of Tuberculosis Control, Calgary, Alta.*

ALBERTA was the second Province in Canada to provide free sanatorium treatment for its residents. Its tuberculosis death-rate is the third lowest, being lower in Saskatchewan and Ontario.

The Tuberculosis Act of 1936 authorized free sanatorium treatment and free diagnosis for residents irrespective of their economic status, with the cost being borne by the revenue of the Province. The Act is administered by the Division of Tuberculosis Control of the Department of Public Health, with headquarters at the Central Alberta Sanatorium, Calgary. A sub-office and clinic is located at present in the General Hospital in Edmonton.

### ORGANIZATION

While the treatment and diagnostic facilities are the immediate responsibility of the Division of Tuberculosis Control, three other major organizations co-operate extensively in the anti-tuberculosis work:

1. The Provincial Government provides: (*a*) free treatment; (*b*) free diagnosis.

2. The Alberta Tuberculosis Association: (*a*) assists in diagnosis; (*b*) provides a rehabilitation service; (*c*) fosters education and publicity.

3. The Indian Affairs Branch (Federal) provides: (*a*) free treatment for Indians; (*b*) free diagnosis for Indians.

4. The Department of Veterans' Affairs (Federal): (*a*) maintains pensioners in the Provincial and the Charles Camsell Sanatoria; (*b*) conducts a rehabilitation and follow-up service.

The Central Registry keeps records of known cases of tuberculosis, deaths, contacts, and suspected cases. These are classified alphabetically and by municipalities, and from these, clinic schedules and other control efforts are prepared.

### OBJECTIVES IN CONTROL MEASURES

(1) Modern treatment of active cases. (2) Diagnosis: (*a*) Clinic examination of ex-patients, contacts and suspects; (*b*) x-ray surveys of the general public by mobile units; (*c*) assistance in diagnosis to practising physicians. (3) Edu-

---

* Read at the Alberta Medical Association meeting, Calgary, September 24, 1948.

cation—medical students, nurses, general public. (4) Rehabilitation of those needing the same.

*Treatment.* — Sanatorium beds: Central Alberta Sanatorium 288; tuberculosis sections of Edmonton hospitals 200; Charles Camsell Hospital, Edmonton 320; total 808. Approximately 3 beds per annual tuberculosis death.

A new sanatorium in Edmonton, on the University property, is under construction. It will provide 300 beds and should be open in 1950.

It is aimed to give modern treatment to all active cases, especially infectious ones. This includes surgical, medical and dental services. At present, non-pulmonary cases, which are not grossly infectious, are not included within the scope of the Tuberculosis Act, but it is anticipated that, as soon as possible, the Government will extend free treatment to sufferers from all forms of tuberculosis. (*a*) In-patients: In 1947 the Department of Health treated 747 patients and the Indian Affairs Branch treated 440 patients. (*b*) Out-patients: These are artificial pneumothorax patients. In 1947, 1,847 refills were given 147 patients at certain points outside Edmonton and Calgary, while 3,357 refills were made at the Sanatoria.

*Diagnostic clinic service is free.—Clinics.*— Central Alberta Sanatorium—Monday, Wednesday p.m.; Calgary Health Department — Wednesday p.m.; Edmonton Clinics—Tuesday and Thursday p.m.

Lack of medical staff since the war has restricted clinic service to x-ray only at Lethbridge, Medicine Hat, Drumheller, Red Deer, Stettler, Camrose, Vegreville and St. Paul des Metis. Travelling clinics have not been resumed since the war. A degree of x-ray service is provided on application of practising physicians.

*Mobile x-ray surveys.*—It is aimed to x-ray the entire population periodically to discover unknown cases of tuberculosis. (*a*) Those with and without symptoms. (*b*) The chronic spreaders of infection.

The mobile units were purchased by the Alberta Tuberculosis Association from Christmas seal funds, at a cost of over $40,000 and are loaned to the Division of Tuberculosis Control for operation.

How is this service organized? The Alberta Tuberculosis Association employs a full-time organizer and is responsible for bringing people to the units for x-ray. The Division of Tuberculosis Control provides the technical staffs, operation expenses, and maintenance of units. It interprets and reports on the films. Reports are made to Medical Officers of Health, to the family physician, and to the patient in all significant cases. It re-examines many patients to establish a definite diagnosis.

A similar survey service is available at Central Alberta Sanatorium daily from 9.00 a.m. to 5.00 p.m. Physical examinations are not made, and reports made only on abnormal films of significance. The Indian Affairs Branch, assisted by the Alberta Tuberculosis Association, purchased a Mobile Unit and regularly surveys all reserves. In 1947, Indians surveyed numbered 5,646.

*Services rendered physicians and hospitals during 1947.*—(*a*) Laboratory examinations of sputum, urine, etc., numbered 1,459. (*b*) Tuberculin for diagnosis was sent regularly to 13 health units and clinics, to 11 hospitals, and to physicians asking for the same. In a Province where many people do not react to the tuberculin test, its use is of invaluable assistance in the diagnosis of tuberculosis. (*c*) Interpretations of x-ray films sent in were 5,924.

*Education.*—Medical students receive clinical instruction from physicians of the Division of Tuberculosis Control, and of the Indian Affairs Branch in Edmonton. Nurses receive courses of lectures in some of the hospitals in Edmonton, Calgary and Lethbridge. It is hoped that affiliation of training schools and sanatoria may soon be accomplished, as has been done in some Provinces. Full-time physicians engaged in tuberculosis work are encouraged to do post-graduate work through the scholarships provided by the Alberta Tuberculosis Association.

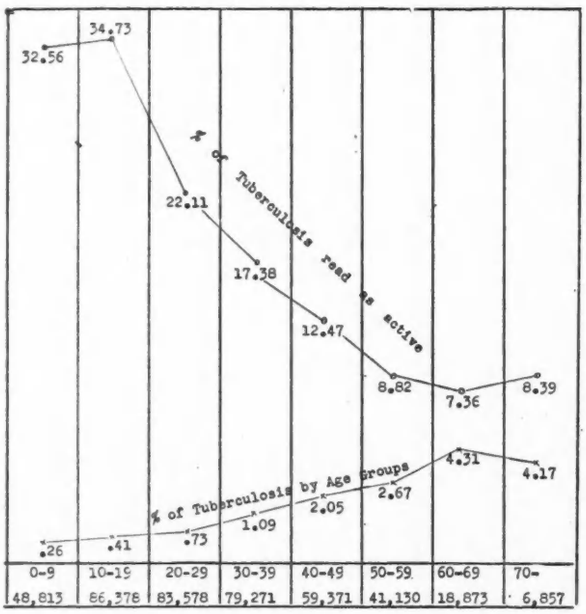
The general public is kept in touch with tuberculosis by means of lectures, newspaper articles, radio addresses and the distribution of literature. Great credit is due the Alberta Tuberculosis Association for the splendid increase in interest during the past few years.

*Rehabilitation.*—The readjustment of the ex-sanatorium patient to normal life, after months of treatment, requires definite attention in numerous instances. This activity is in the hands of the Alberta Tuberculosis Association. A full-time rehabilitation officer is employed, all patients are interviewed, advice given as to suitable employment, assistance in retraining

where necessary, and help in obtaining remunerative employment. Rehabilitation begins when the patient enters the sanatorium. The rehabilitation officers of the Alberta Tuberculosis Association and the Department of Veterans' Affairs co-operate in this most valuable work. No ex-sanatorium patient should become a drifter.

*B.C.G.* — This vaccine, prepared from the strain of the tubercle bacillus developed by Calmette and Guerin, has been in use throughout the world over 20 years. It has been used in millions of cases. It is reported to be harmless and to give partial immunity, and to reduce the incidence of disease by about 75% in those exposed. In Alberta it is being advocated for non-infected persons who are especially liable to contact with open tuberculosis: (1) nurses

RADIOLOGICAL DIAGNOSIS OF TUBERCULOSIS IN 424,271 FILMS (4 x 5)




in training and medical students; (2) employees in general hospitals, mental hospitals and sanatoria; (3) uninfected members of families where tuberculosis exists.

*Field workers.*—The Division of Tuberculosis Control does not maintain such a service. In Edmonton and Calgary, full time tuberculosis nurses are employed by the Alberta Tuberculosis Association. Elsewhere, wholehearted co-operation is given by Public Health Nurses, who are kept informed regarding tuberculous patients in their respective districts.

*X-ray of general hospital admissions.* — Through assistance from the Alberta Tuberculosis Association, several hospitals are now making chest x-rays on admission of patients, to further discover the presence of this disease.

*Mobile x-ray survey findings.*—From September, 1943, until May 31, 1948, 424,271 people were x-rayed. Of every 1,000 people x-rayed, 13 showed probable tuberculosis. Of every 1,000 people x-rayed, 1.8 showed probable active tuberculosis. Further examination was requested in 4,296 cases or in approximately 1% of those x-rayed.

### CONCLUSION

1. The successful co-operation of governmental and voluntary agencies has been found practical.
2. X-ray surveys discover a higher percentage of tuberculous chests in the older age groups but more active cases in the younger groups.

## A REVIEW OF TRACHOMA

**W. Barr Murray, M.D.**

*Calgary, Alta.*

TRACHOMA is a contagious disease caused by an unidentified organism which exhibits some characteristics of both viruses and rickettsiæ. The organism causes a local inflammation of the conjunctiva, both tarsal and bulbar, characterized by the formation of granules, corneal ulcers, pannus, scar formation and paralysis of the palpebral muscles.

*History.*—The story of this disease begins in the earliest writings of the human race. The earliest Egyptians vaguely described a granular conjunctivitis. In many writings the disease can be suspected by a description of granules, and by the use of copper salts, which were in common use up to a few years ago.

Aristophanes in "The Frogs" describes what might be trachoma, also Xenophon in "The Retreat of the Ten Thousand". In the "Hippocratic Collection" there appears a fair description of this disease and a program of treatment by everting the lids and rubbing "with clean, thick wool wound round a wooden stick", which treatment was used until recently. Celsus and Scribonius Largus used copper ointment; Dioscorides, "friction with rough fig leaves". Galen compares the appearance of trachoma with that of a fig cut open. The appearance of the light-coloured seeds against the darker pulp is analogous to that of palpebral trachomatous con-

junctivitis. This similarity can be suspected to have given rise to scarification with fig leaves.

Contrary to practice among the Greeks, the Arabs had oculists who specialized in eye conditions. Many of these left writings on the disease but probably the greatest of them was Ali Ibn-el-Aissa at Baghdad in the eleventh century. In his treatment he combined scarification with a great variety of instruments with a complicated system of medication too lengthy to describe here.

*Distribution.*—Trachoma appeared in Europe during the Napolean wars and is thought to have been carried by the soldiers returning from Africa where it was, and is, endemic. It rapidly spread throughout all Europe, showing a partiality to certain areas. It is most common in the Balkan States; it is more common in Ireland than elsewhere in the British Isles. It is more common at low altitudes than high and on plains than in wooded country.

The organism also appears to have an affinity for some races. It is common among Poles, Mongolian races and Jews throughout the world. It is rare among Negroes except in Northern and Western Africa. It affects lower classes oftener than upper classes although in Egypt in an upper class school 92% of the students were infected. Distribution is now world-wide and in some countries almost the total population is affected, as evidenced by the following figures: Egypt 98%, India 75%, Siam 65%, Malay and Poland 50%, Italy, Greece, Argentina, Brazil and Central America 30%, Mexico 25%. United States Indians had an incidence of 26% in 1937 which was reduced by treatment to 3% in 1941. It was recognized in Canadian plains Indians in 1932 but is not found in wooded areas. It is estimated that a third of the population of the world suffers from trachoma, which fact gives the disease an importance seldom realized.

A digression may be pardonable. In view of the world-wide distribution and the total of world incidence, any physician is likely to meet a case of trachoma. Yet indifference to the disease is noted among general practitioners, ophthalmologists and textbooks. A remark was recently heard, "But we do not see any trachoma". The only answer to that is, "Yes, you do". In a country with a population of mixed race and ex-service men returned from all continents of the world, trachoma will be seen if looked for. It must be assumed that every practitioner who has patients from all walks of life sees cases of trachoma, too often unrecognized.

*Etiology.*—While trachoma is caused by a living organism which is transmissible from the patient to his associates, there are certain predisposing factors of great significance. The geographic distribution suggests that sun, wind and dust may make the conjunctiva more receptive to the causal organism. While trachoma is common among the prairie Indians of Western Canada, it is not seen among the Indians in the forest areas farther north. Living conditions of the plains Indians and woods Indians are practically identical in habits, nutrition and cleanliness. The most marked difference between the two groups is in sunlight, wind and dust, and as these conditions occur also in Egypt, India, and the Balkan plains where the incidence is also high, it must be assumed that these factors set up an irritation of the conjunctiva which assists the causal organism to gain an entrance into this tissue.

It is also noticeable that the incidence of trachoma is greatest in the lower economic groups of the population of a country, and is greatest in countries which have a large percentage of indigent population. Egypt and India have large numbers of people in low income brackets and trachoma is most common there. Within these countries the incidence lessens progressively in groups with better economic standing. While the Negro race is within the trachomatous economic standing, the disease is rare among them, indicating a racial resistance. A great part of Negro Africa is heavy forest which also lessens the disease. Jews appear to have a racial susceptibility to trachoma. It can only be guessed in what manner a low economic status increases susceptibility but probably poor nutrition lessens the resistance of the tissues, and low standards of cleanliness and sanitation facilitate the passage of the organism from person to person.

In Egypt the main factor in dissemination of trachoma is flies. It is a common sight to see clusters of flies feeding on the discharge of inflamed eyes. In that country contamination by fingers is considered of little importance, whereas in America fingers assume the chief rôle; fingers and other agents which come in contact with the eyes, common towels, pencils, rulers, etc. It is a too common practice among races who use head-shawls (Central

Europeans and North American Indians) for a mother to wipe discharges from her eyes with the ends of the shawl and to wipe her baby's eyes with the same garment.

Causative organism: Much difficulty is occurring in finding the organism giving rise to trachoma. The only experimental animals found susceptible to trachoma infection are monkeys and apes and of these the most satisfactory is the Sudanese monkey (*Laseopyga griseoviridis*). The inoculation of trachomatous material into the eyes of these animals causes a mild congestion of the conjunctiva and follicles in the upper fornices: vascularization of the cornea does not appear, neither does tarsal folliculosis nor scarring of the conjunctiva. Intracellular inclusions are not found. Bland[4] has reported that simian trachomatous material transferred to the human eye causes the typical findings of the disease.

Many investigators considered the causative organisms to be a rickettsia but Wilson[3] and others were far from convinced. This skepticism resulted in work done by Dr. Phillip Thygesen of Columbia University working on baboons. To quote from his report to the Indian Service of the U.S.A.:

> "The studies on etiology have been completed with the conclusion that the agent of trachoma is filterable, that it has three principal virus characteristics, namely: filtrability, inclusion body formation and inability to grow in bacteriological media. Trachoma virus differs from the typical large virus variation, having both large and small forms and also in the fact that it stains well with Giemsa, whereas the elementary bodies of the typical virus require mordants or special staining procedures. Trachoma virus and the viruses of inclusion blennorrhœa, psittacosis and lymph-granuloma inguinale appear to form a group of atypical viruses transitional between the typical viruses and the rickettsiæ."

This is the most recent full report that could be found and the findings are the most conclusive.

*Epidemiology.*—Trachoma is endemic rather than epidemic, in fact no epidemics have been reported. The causative organism can only be considered mildly contagious as compared with the agents of smallpox, diphtheria, measles, etc. The results of the disease are of more importance than its contagion as one out of 17 cases goes blind and 50% develop visual defects uncorrectable by glasses. A possibility exists of a carrier state. Bodian[8] reports that 34% of natives of Fiji free from the disease had conjunctival inclusion bodies identical with those of trachoma. Apparently there was no attempt made to transmit the disease from these people to monkeys or other humans.

*Pathology.*—Wilson[3] and Bland[4] are in concurrence with Loe[1] that the earliest changes occur at the upper half of the junction of the iris with sclera. In five to seven days after infection the slit lamp will show a gradually developing appearance of œdema and engorgement of the limbus vessels with extension of the capillary loops into the cornea. This provides an early diagnostic sign of the greatest significance.

The main feature of the disease is the formation in the conjunctiva and subconjunctival tissues of follicles composed of lymphoid cells. These are found principally at the upper limit of the tarsal cartilage and cul-de-sac and to a less degree in the tarsal conjunctiva and lower lid. At first the follicles are needle-point in size and grow in diameter rather than elevation till they become dome-shaped plaques the diameter of a pencil lead. Wilson[3] found that the typical intracellular inclusion bodies were present in the infected epithelium up to three months but after that time could not be demonstrated. These were coccus-like in formation identical with Prowazek's bodies found in inclusion blennorrhœa. The absence of these bodies in the early stage is proof that the examined tissue is not tracheomatous. From a diagnostic point of view, the presence of inclusion bodies in the first three months of infection is important; their absence after that time is not important.

After a varying length of time the follicles give rise to a persistent but subacute inflammation with engorgement of the blood vessels, hypertrophy of the papillæ of the conjunctiva and to overgrowth of fibrous tissue in the mucous and submucous layers with ultimate contraction. The cicatricial development has an atrophic effect on the conjunctiva. The mucous cells are deprived of nutriment, causing lack of function and the conjunctiva becomes free of mucus and is moistened only by the lachrymal secretion. The papillæ are lost and a smooth appearance results.

In the cornea these changes result in the formation of an opaque curtain—pannus—crescentic in shape, which starts at the upper limbus and grows steadily downward till the pupil is obscured and blindness results. Commonly "nutrition" ulcers are formed at the centre of the

cornea. The pannus is vascular and the vessels can be seen to be continuous with those of the sclera first under magnification and later by the naked eye.

Contraction of cicatricial tissue in the lids causes a horizontal narrowing of the palpebral fissure causing pressure against the eyeball with further aggravation of the destructive processes and increased annoyance to the patient. The general contraction affects the tarsal cartilage by bending it into a boat-shape with resulting entropion. Muscles become paralyzed, which causes ptosis of the upper lid and entropion of the lower. A patient has been seen with her upper lids held upward with adhesive tape over the eyebrow to overcome ptosis and make vision possible. The horizontal contraction of the palpebral fissure causes its point of greatest width to shift medially to the nasal side of the pupil.

*Symptoms.*—The symptoms of trachoma are entirely local and confined to the eyes. The earliest symptoms are itching, photophobia, lachrymation and scratching of the upper lid on the cornea. The wearing of sunglasses is commonly adopted, which gives some relief for a time, but meantime the pathologic processes progress until the patient's attention is again drawn to his eyes by inability to raise the upper lids fully, or ulcers of the cornea. It is common for the patient to first consult a physician at this time when destructive changes have occurred that are irreversible. Treatment at this time can only stop further progress of the disease, but can have no effect on ptosis or contracture. It is reported that modern treatment sometimes causes a thinning of the pannus, permitting some degree of vision.

Further symptoms are the result of destructive changes which have occurred. Secondary infections occur with pus formation, usually of whitish, thin nature. Entropion gives rise to scratching of the bulbar conjunctiva. If the disease is unchecked total blindness results from the progress of the pannus or from perforation of a corneal ulcer.

*Signs.* — MacCallum's classification of the stages of trachoma is useful when examining an affected eye:

Tr. I.—Subepithelial lymphocytic infiltration with or without lymphoid follicles.

Tr. II.—The stage of complication with the development of conjunctival blebs or papillary hypertrophy.

Tr. III.—The onset of scarring and the absorption of lymphocytic infiltration.

Tr. IV.—Complete cicatrization with no apparent inflammation.

As has been mentioned above the earliest sign of the disease is an appearance of œdema of the upper half of the limbus with branching of the capillary loops which branches extend into the cornea. These vessels are only seen under the illuminated magnification of the slit lamp. For this purpose a hand lamp powered by flash-light batteries, is sufficient. It will be noticed early that the conjunctiva loses its normal gloss and becomes a dull cherry colour. The subacute inflammation progresses until the palpebral conjunctiva assumes a dark cherry colour and the lines of the blood vessels are lost. At this stage, the lid looks like a swab saturated with venous blood.

The follicles first appear at the upper margin of the tarsal cartilage and in the cul-de-sac, later extending over the tarsus and appearing in less numbers on the lower lid. These are round, dome-shaped elevations the diameter of a pencil lead and are easily visible. The follicles are scattered over the conjunctiva rather than in any linear formation.

The characteristics of a pannus are definite. It always begins at the upper pole of the limbus and is seen as a crescentic grayish white curtain which inevitably progresses downward over the pupil. Blood vessels are seen which are continuous with those over the sclera at the upper corneal margin. A characteristic feature of a trachomatous corneal ulcer is that it is always located at the exact centre of the cornea, the point farthest from the blood supply. The reason for this is obvious when it is remembered that the ulcers result from poor nutrition.

The signs of the end result of trachoma are unmistakable. One sees a narrowed palpebral fissure with the upper lid hanging downward over the pupil, the lashes turned inward and scratching the shrunken and shrivelled eyeball. The lower lid is hanging outward displaying the conjunctival lining. The cornea is a thickened ash-coloured mass with visible blood vessels,—not a pretty sight!

*Differential diagnosis.*—Positive diagnosis of trachoma can be made earliest by inspection of the cornea, in fact cases are seen with little or no involvement of the lids. As folliculosis, vernal conjunctivitis and inclusion blennor-

rhœa give a closely similar picture of the lids corneal changes at times must be relied upon. As the early changes in the cornea, the changes that must often be depended upon, are not visible to the naked eyes, the illuminated magnification provided by the slit lamp must be used. In some cases visible corneal changes occur before much involvement of the lids. Any variation can occur and sometimes the diagnosis must be made by response to treatment with sulfanilamide.

The earliest change in the cornea starts invariably at the upper pole of the cornea, at the junction of cornea and sclera, and is visible with the slit lamp as a branching of the superficial blood vessels. These branches extend toward the central point of the cornea and at this point an ulcer may occur, which differentiates trachomatous ulcers from those of other sources. The ulcer is due to destruction by the infection of the superficial cells beyond the recuperative capacity of the tissues.

The diagnosis of late cases presents no problem as the appearance of the narrowed eye, ptosis of the upper lid, the follicles on both lids, the grayish white pannus with visible blood vessels descending over the cornea, are characteristic of the condition. The characteristics of folliculosis are a catarrhal inflammation and lines or blocks of follicles, usually found in children. The follicles increase in size as does the inflammation and then may resemble trachoma. Usually the follicles disappear in a short time, at other times they enlarge and become scattered over the conjunctiva but the areas between the follicles remain normal, whereas in trachoma the areas are deeply reddened.

Vernal conjunctivitis can usually be identified by its occurrence in spring time. Itching is much greater than in trachoma. A stringy secretion accumulates in the cul-de-sac which is tenacious and reappears when removed.

Inclusion blennorrhœa closely resembles trachoma and also responds to sulfanilamide. However, inclusion conjunctivitis usually occurs in the lower lid, is more common in negroes and does not lead to scar formation and pannus, which differentiates it from trachoma. However, in the early stages reliance must be placed on vascularization of the cornea at the upper pole as revealed by illuminated magnification, to identify trachoma.

*Prevention.*—Prevention of this disease depends wholly on recognition of the condition early by the first medical attendant who sees the patient, whether it be doctor, nurse or orderly. Unfortunately, early recognition is not always the rule and the patient goes on infecting his associates until he has lost a part of his vision and consults his physician at a time when the diagnosis could be made from across the street. By this time his entire family will probably be infected and his children in school will be infecting children of other families. Only the fact that the virus is mildly contagious, protects the population.

Probably the next important means of prevention is notification. It is likely there is at least one case of trachoma within the jurisdiction of every local board of health. In all areas, trachoma should be a notifiable disease and the board of health should have standards of treatment. In North America the Indians constitute the greatest hazard. In 1932 Canada appointed Dr. J. J. Wall, who visited all reserves, examined all available Indians and instructed the local medical attendants in diagnosis and treatment. Since his retirement the problem is entrusted to the local doctors. In 1937 the Indian Service of the United States instituted a survey, research and treatment of trachomatous Indians, reducing the incidence from 26 to 3%.

Treatment is a big factor in prevention. An infected individual becomes non-infectious in three to five days of effective treatment. If all cases in a group could be got under treatment, dissemination would stop. As unsanitary habits are a great force in dissemination, education of individuals and families must be undertaken. Such education should eliminate common towels, loaning of personal belongings, care of the secretions of the eyes and close observation of young children. Schools should be closely watched to ensure habits of cleanliness.

Trachoma should be handled as any other public health problem by compulsory notification and compulsory treatment.

*Treatment.*—The history of the treatment of the disease shows that attention was directed mostly to avoiding the distorting results of the infection. If the disease goes untreated large masses of scar tissue form and contract, thus changing the shape of the tarsus and cornea. Previous treatment was directed toward producing smaller scars, if scars had to be, and

thus lessen the distortion. Thus Kanpp's roller forceps expressed the follicles and numerous small scars resulted. The same idea prevailed in using the "boracic rub", by which the follicles were rubbed off with moistened absorbent cotton dipped in boracic powder. Then followed copper sulphate and silver nitrate. It now appears questionable whether these treatments had the desired effect; they definitely did not cure the disease.

The United States Indian Service commenced treatment of trachoma with sulfanilamide in 1937. The dosage adopted for patients under continuous observation was 1/3 grain per lb. of body weight daily for 10 consecutive days, then 1/4 grain per lb. for 14 days. No other medication was permitted. Improvement was noted in five days, as indicated by decreasing photophobia, lachrymation and pus. Cures in previously untreated patients resulted in one month while those who had been treated by older methods for one to seven years, required sulfanilamide in some cases for as short a period as two weeks to produce a cure. Daily blood counts were done, at first, then the interval lengthened to monthly and yearly for several years. Even the thick pannus of old blind cases thinned out so that some measure of vision was possible.

The Canadian Indian Affairs Branch started a treatment program devised by Wall, for Indians not under observation. This schedule called for ¼ grain of sulfanilamide per lb. of weight daily for two weeks and one week interval. Three such courses were recommended but could be kept up longer if necessary. Cures resulted in the majority of cases; when a cure did not occur in three courses it was suspected the treatment was not followed closely.

Miterstein and Stern[2] combined local treatment with systemic treatment. Their choice of medication was pyranil, (Teva, Ltd.), an ointment of 5% p-aminophenyl-sulfonamide and pyridine-dicarbonic acid anhydride, with sulfanilamide and sulfapyridine by mouth. Dosage of sulfapyridine was 0.05 gm. per kg. body weight daily in doses every 2 to 3 hours for 3 days then gradually diminished for the next 4 or 5 days. Corneal complications, as pannus and ulcer, were treated with pyranil ointment and sulfanilamide with excellent result.

Bland and Wilson[5] state that the sulfonamides have been disappointing in the treatment of trachoma in Egypt except when the condition is accompanied by an acute ophthalmia. For this purpose sulfapyridine, sulfathiazole and sulfadiazine are equally effective and the latter is preferred because of lower toxicity.

Darius[6] reports that trachoma responds to penicillin treatment. Twelve cases were treated with a solution of the sodium salt of 500 units to 1 c.c. of water. This was dropped into the eye every 3 hours and in some cases every half hour. Improvement was more rapid on the half hour schedule. In 24 to 48 hours there was loss of photophobia and lachrymation; on the third day improvement in vision occurred and paling and thinning of the palpebral conjunctiva; on the fifth day there were shrinking and retracting of the corneal vessels and thinning of the corneal infiltrate. This treatment also promoted rapid healing of the ulcers. The total effect was not superior nor quicker than was that of treatment with sulfanilamide, but penicillin will be useful for cases which are resistant to sulfonamides.

Some benefit is reported from irradiation with ultra-violet light.[9] The lids were everted and exposed 30 cm. distant from the tube for 3 to 10 min. for 6 applications at 3 or 4 days' interval. Two cases healed and in four others the granulations diminished.

Most writers report the result of treatment with sulfanilamide. It was with this drug alone that the incidence of trachoma in United States Indians was reduced from 26 to 3% in four years. Why this particular sulfonamide was chosen is not clear. It was the first of this group of therapeutic agents to become well-known and a possibility exists that the continued use of it persists for that reason. Bland and Wilson[5] report that sulfadiazine is equally effective. Such being the case it is the drug of choice.

Two routines of treatment are necessary in handling, one for hospital patients and another for outpatients. Patients are very rarely hospitalized for trachoma *per se* but it may be a concomitant condition. For purposes of research it is imperative to have the patients in hospital.

From a study of the various treatments reported a system for hospital patients is suggested. A white blood count should be done on admission. Sulfadiazine should be administered

at the rate of 1/3 gr. per lb. of body weight per day in divided doses every three hours for 6 doses daily. The above dosage should be continued for 10 days, then the dosage reduced to 1/4 grain per lb. for 14 days. During the administration of sulfadiazine the white cell count should be done daily. The administration of penicillin drops in a strength of 500 units per c.c. is recommended concurrent with the sulfadiazine. It may be argued that this is unnecessary, which may be true, but making use of the proved synergistic action of the two agents it is thought wise to use the full armamentarium.

For out-patients treatment is limited to medication the patient is likely to take when on his own responsibility and also by the lack of opportunity to check the white blood cells. It is probably best not to exceed the quantity of ¼ gr. of sulfadiazine per lb. of weight for 14 days, then a rest period of one week and repeat this schedule twice. Some patients are impressed by local treatment and to such penicillin eye drops may be given. If signs of activity persist after the 8 weeks' course of treatment outlined and it can be established that the patient has followed instructions the diagnosis should be reviewed and the patient kept under control for a further course of treatment.

SUMMARY

Old and recent writings on trachoma have been reviewed bringing the outstanding data on the disease together in a single article. An outline of treatment with sulfadiazine and penicillin is recommended, thus applying the newest drugs to a problem that is over 5,000 years old.

A plea is made particularly to general practitioners to be on the watch for trachoma, as early treatment will prevent the catastrophic end results of the disease and lessen dissemination. Constant watch needs to be kept as reinfection is possible.

REFERENCES

1. LOE, F.: *Sight Saving Review*, 17: 16, 25, 1947.
2. MITERSTEIN, B. AND STERN, H. J.: *The Lancet*, May 19, 1945.
3. WILSON, R. P.: 14th Rep. Memorial Ophthalmic Laboratory, Giza, Cairo for 1939-44, p. 13.
4. BLAND, J. O. W.: 14th Rep. Memorial Ophthalmic Laboratory, Giza, Cairo for 1939-44, p. 89.
5. BLAND, J. O. W. AND WILSON, R. P.: 14th Rep. Memorial Ophthalmic Laboratory, Giza, Cairo for 1939-44, p. 49.
6. DARIUS, D. J.: *Am. J. Ophth.*, 28: 1007, 1945.
7. MACCALLUM, A. F.: Trachoma, Butterworth & Co., London, 1936.
8. BODIAN, M.: *Am. J. Ophth.*, 30: 758, 1947.
9. KOSEBAY, B.: Dirim (in Turkish) 1-2, 15-16, January and February, 1947.

1311-12th St. West.

## CONGENITAL BLINDNESS (PSEUDOGLIOMA) OCCURRING AS A SEX-LINKED DEVELOPMENTAL ANOMALY*

**W. M. G. Wilson, M.D.**

*Vancouver, B.C.*

THIS study deals with the findings in a family of Indians from Manitoulin Island, Ontario, in which several of the males over three generations were blind at birth. Ten members of this family have been examined at the Hospital for Sick Children, Toronto, and others seen elsewhere. These ten cases include five of the blind males, all brothers or half brothers, from three of whom an eye was enucleated for diagnostic purposes. Sections of these eyes, and the pedigree, are pictured and will be discussed. All five of these boys showed evidence of gross bilateral ocular anomalies of the pseudoglioma group.

Among the causes of blindness occurring in infancy and early childhood, pseudoglioma forms a significant percentage. The term is inclusive and applies to several disease conditions of childhood which, together with true glioma or retinoblastoma have in common a single clinical feature. This is the reflection of light from a sightless eye, known as the amaurotic cat's eye, first described by Beer[1] in 1817. For the production of this phenomenon two factors are necessary, (*a*) transparency of cornea, aqueous and lens, and (*b*) the presence in the vitreous chamber, close behind the lens, of a white or clear-coloured surface capable of reflecting light entering through the pupil.

Both acquired and congenital conditions are included in the group, classified clinically as pseudoglioma. Since it is clear from the history in the cases here presented that the blindness was congenital, the acquired group will not be considered. In the truly congenital type, which means those showing pathological changes at birth which have originated *in utero*, are included inflammatory conditions, hæmorrhage, phthisis bulbi, tumours and, most numerous, embryological arrests and anomalies of development causing gross ocular malformations. These anomalies, according to Ridley and Soresby,[2]

* Read at the Academy of Medicine, Toronto, Section of Ophthalmology, on January 26, 1948.

From the Department of Ophthalmology, University of Toronto, and the Hospital for Sick Children.

may be either one of or a combination of the following: (*a*) persistence of the posterior vascular lens capsule; (*b*) persistent hyaloid artery with proliferation of its sheath; (*c*) failure of complete involution of the primary optic vesicle (detached retina) and (*d*) congenital retinal septum or fold. In these four types the eye is usually microphthalmic. It is of interest here to note that Duke-Elder[3] and Mayou[4] draw a distinction between congenital detachment of the retina and congenital non-attachment, the former being a pathological accident occurring before birth and the latter a true developmental anomaly. Indeed, most writers, in discussing pseudoglioma, point out that retinal detachment is a frequent finding in these eyes, regardless of other disease. The explanation for this, as Ida Mann[5] shows, is that during a large part of intrauterine life the connection of inner and outer layers of the optic cup is very indefinite. This potential cavity, of course, persists through adult life, and an anatomical continuity is never established.

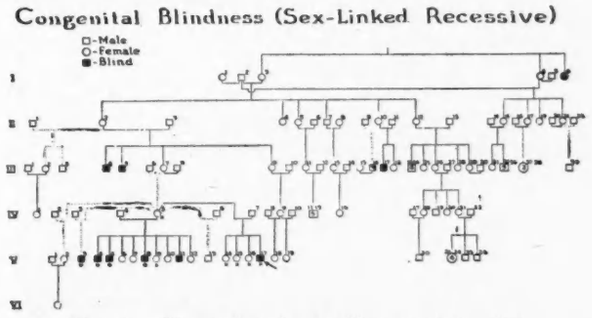



**Fig. 1.**—Chart showing pedigree of family.

Fig. 1 shows the pedigree of the family, constructed and verified from church and Indian agency records. It reveals that (*a*) the defect is limited to the males, with one exception, and is transmitted through the females; (*b*) in generation V the six blind males have in some cases different fathers but the same mother; (*c*) normal males occur in each generation and (*d*) the fathers of the blind males had, in each case, normal eyes.

The blindness of I 6, which was possibly acquired in childhood, will be discussed later. In generation III, 2, 3 and 4 died while young, cause of death unknown. Reports, not verified by records, indicate that there may have been other blind siblings. III 17 died in a mental hospital, cause unknown, in middle age. The mother, IV 5 in generation IV had five fathers for her children who were two Indians, a quarter-breed and two whites respectively; all of them are reported to have had normal eyes.

In generation V all the blind males except V 11 who died in infancy, have been examined at the Hospital for Sick Children, as well as the mother IV 5 had several daughters. Ocular examination of the mother and of V, 9, 14, 15 and 16 revealed normal vision (except for small refractive errors), normal fundi and no evidence of ocular congenital anomalies. The normal male, V 13 was examined by the doctor on the Reserve and reported as having normal vision. Many others, male and female, have been reported by him and other doctors as having normal eyes.

In the blind males in generation V the defect was noted by the mother shortly after birth in all except V 3. This boy, being illegitimate, was taken from her for adoption the first day after birth, and returned to her when the blindness was obvious. She states that the pregnancies were normal, but with the males except two, V 13 and 17, labour was prolonged and difficult. On the other hand, with the females she had short easy labours except with V 7 and 14. She had not connected these facts with the incidence of blindness and one hesitates to ascribe any significance to this history.

### CASE 1

This study was initiated by the admission to the Hospital for Sick Children, of V 17, aged 18 days, on September 25, 1947. The mother had noticed a pale greenish-yellow reflex in each eye shortly after birth. On examination both eyes presented much the same appearance, the lids being normal, the globes normal in size with clear corneæ, shallow anterior chambers, dilated fixed pupils and normal tension. There was no apparent light perception in the right eye, but in the left the infant blinked and withdrew when a bright light was suddenly presented. Behind the clear lens, with oblique illumination was a greenish-gray, brightly reflecting smooth surface with some ill-defined dark red areas and new blood vessels upon it. An irregular ring of small blood vessels was present at the border of the pupil, anterior and posterior to the lens. No reflex was seen on transillumination of the globe. The x-ray examination showed no abnormalities of the orbits and no psammoma bodies were evident either before or after enucleation. Apart from the eyes the infant appeared to be normal, and no abnormalities were found on general physical examination. The blood Wassermann was negative.

Enucleation O.D. was done on October 2, 1947 under general anæsthesia and a plastic ball implant inserted. Except for a mild upper respiratory infection recovery was uneventful.

Fig. 2 shows a section of the eye which measured 17 x 16 x 15 mm. The cornea and lens are clear and it is considered that the appearance of adhesions between iris and cornea are artefacts. The pars plana shows increased fibrous tissue and the ciliary processes are hypertrophied. Behind the umbrella detachment of retina there is a sub-retinal mass of pink-staining, albuminous exudate and a thick fibrous stalk, evidently

long present. The retina is thickened and thrown into folds and made up largely of embryonic cells with no normal retinal structure. Behind the lens there is a mass of fibrous tissue and a large cystic space containing old hæmorrhagic material and debris. There is no evidence of any marked inflammatory process. These observations suggest a developmental anomaly, present for some time. It is obviously not a simple retinal detachment, but a non-attachment, with retro-lental hyperplasia and persistence and proliferation of the hyaloid artery and its sheath.

### CASE 2

This boy V 8, aged 2½ months, was admitted to the Hospital for Sick Children on July 9, 1935, with lobar pneumonia and a history of blindness since birth. The mother stated that for ten days after birth the eyes appeared normal but then became "smoky". The clinical notes are brief, and summarized, state that both eyes had much the same appearance, with blindness, large iris coloboma and ectropion of the uveal pigment. Each fundus showed, behind the clear lens, a yellowish mass partly covered by pinkish-looking vessels. The tension was elevated in each eye and, apart from the eyes, no other anomalies were found on general physical examination. The blood Wassermann was negative. Enucleation O.S. was done on July 24, 1935, with an uneventful recovery. The infant is said to have died two months later during an epidemic of measles.

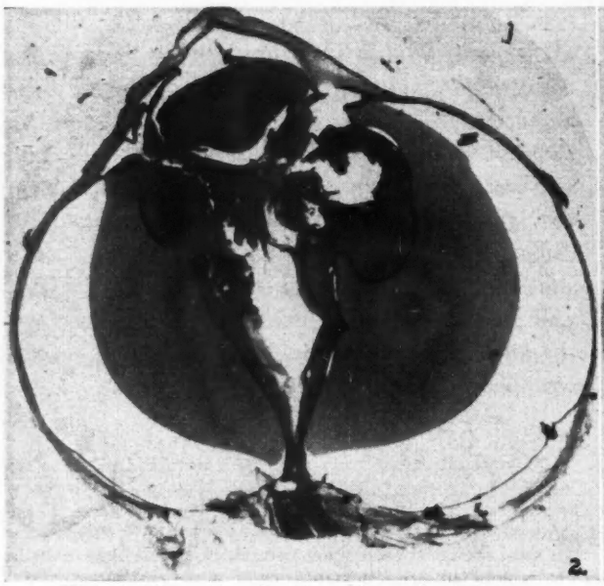


**Fig. 2.** (Case 1).—Section of enucleated eye.

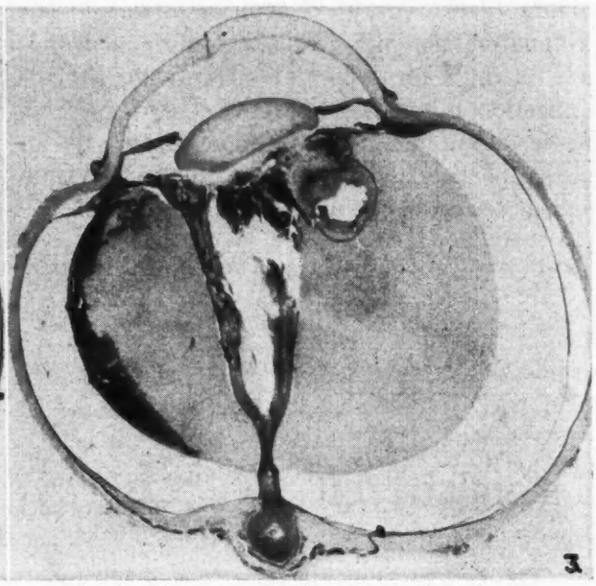


**Fig. 3.** (Case 2).—Section of enucleated eye.

Fig. 3 shows a section of the eye and its similarity to that in Fig. 2 is very obvious. The eye measured 21.5 x 21 x 20.3 mm. Briefly, the findings include a clear cornea and lens, deep anterior chamber with wide anterior synechiæ at the filtration angle and a rudimentary iris with ectropion of pigment, with extensive disorganization in the posterior segment. Masses of partly absorbed hæmorrhage underlie the umbrella detachment of the retina, with much fibrous tissue in the stalk and retro-lental space. The retinal layers are greatly distorted by hæmorrhage, connective tissue and scattered pigment, and very little normal retinal architecture remains. This eye, while not showing such marked disorganization as in Case 1, shows obviously more than a simple detached retina. The presence of congenital glaucoma, rudimentary iris with ectropion of uveal pigment, primitive retinal structure with non-attachment of retina, with extensive fibrosis, indicates an embryological arrest occurring fairly late in fetal life.

### CASE 3

This boy, V 4, aged 5 years, was one of three brothers, V 3, 4 and 5, admitted to the Hospital for Sick Children on August 21, 1928. In all three apparently, blindness was present from birth, with what was described as a greyish pupil appearing at about two months of age. The brief clinical notes in this case may be summarized as follows; the shrunken right eye showed a dilated pupil with a small atrophic lens floating far back in a deep anterior chamber. In the posterior chamber there was a mass which was probably inflammatory but may have been new growth. The soft shrunken left eye showed degeneration of the cornea with heavy deposits and an opaque lens. The iris was atrophic and the pupil widely dilated. Both eyes were obviously blind and no record was made of other abnormalities on general physical examination. Enucleation O.D. was done on August 22, 1928.

Figure 4 shows a section of the eye which measured 18½ x 18 x 18 mm. In addition to the very deep anterior chamber and firm anterior synechiæ at the angles, a Morgagnian cataract and an anterior polar cataract are present. Extensive disorganization of retinal structure is apparent with many clefts and areas of embryonic structure, and much fibrous tissue formed behind it and near the nerve head. This latter may have originally been the stalk of an umbrella detachment as was present in the other cases. Lying subretinal to one side is a mass of partly organized hæmorrhage. The effects of five years of compression on the whole posterior compartment are clearly seen, and it is interesting to speculate that the eye may have resembled the other two rather closely at a similar age. There is sufficient evidence of developmental abnormalities in this specimen to indicate that an arrest in development, rather than an inflammatory process, was the original pathogenic feature. The lens opacity, apart from an anterior polar cataract, could be the result of nutritional changes due to the abnormal physiology which must have been present in such an eye, and therefore one can assume that originally this eye could also have been included in the pseudoglioma group.

### CASES 4 AND 5

These brothers V 3 and 5, aged 7 and 2½ years respectively, were admitted with the previous case. The histories given are identical in that the eyes were said to appear normal at birth and for two months after, but then the pupils appeared greyish. Both boys were

blind from birth. The clinical notes are brief and in summary are as follows:

Case 4 (V 3). The right eye showed posterior synechiæ and a soft greyish-yellow lens. In the left eye there was iris atrophy with some uveal ectropion and a dilated pupil. The lens was small and opaque and the vitreous filled with a pinkish mass either due to inflammation or new growth.

Case 5 (V 5). Both eyes showed partly dilated pupils posterior synechiæ and lens opacities. In this case an opinion was recorded that an inflammatory disturbance had caused the synechiæ and lens opacities. No further observations regarding other abnormalities are recorded. Both boys were examined under general anæsthesia. V 3 is still living and is now well known among his tribe as a witch doctor or "bear-walker". V 5 died three years later, cause unknown, at an institution for the blind.

The presence of posterior synechiæ in three of these four eyes is difficult to explain on a primarily embryological basis. In one eye, however, a mass in the

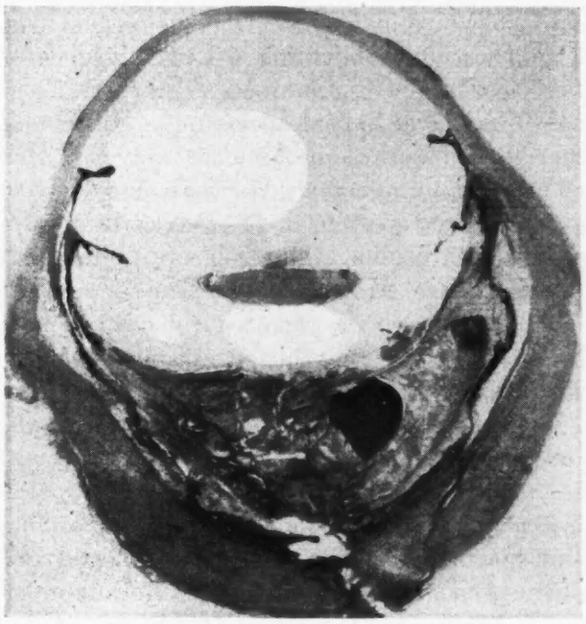


**Fig. 4.** (Case 3).—Section of enucleated eye.

posterior segment was present, and the opaque lenses prevented a clear examination of the retro-lental area in the others. These cataracts may have been congenital, but on the other hand they may have been the result of nutritional changes as was assumed in Case 3. In both instances, therefore, proof of embryological arrest having occurred is not definite, but at least the inference of some congenital anomalies being present is clear for two reasons; (*a*) from the absence in the history of any suggestion of inflammatory disease, and (*b*) the presence of definite fetal abnormalities in the siblings with a similar history. Statements of the mother regarding the appearance of the eyes in early infancy were inconclusive.

## GENETIC STUDY

Reference to Fig. 1 shows the pedigree beginning with the families of an Indian I 2, who married three times, and died in 1881. There were no children by the first wife. The second and third wives were sisters and another sister of theirs was blind.

By the third wife there were born four daughters, one of whom died. The other three married and had seven sons and three normal daughters. By the second wife there were five daughters and one son, all normal. One daughter died and the other four married. One of these gave birth to a blind son, and a son who was found to be blind in one eye at the age of six years. Another daughter gave birth to at least two blind sons and a carrier daughter. This woman had an only child, a carrier daughter who had six blind sons, one son with normal vision and nine normal daughters.

The genetic factor for this defect (congenital blindness) is evidently sex-linked, females being carriers and males showing the defect, and therefore it is on the X-chromosomes. Thus the males are of two genotypes; (*a*) those having normal eyes (XY) and (*b*) those blind (*X*Y), and the females of three genotypes; (*a*) those having normal sight (XX), (*b*) carriers, having normal sight (X*X*), and (*c*) blind women having two defective X-chromosomes (*XX*).

Regarding the blind sister (I 6) in generation I, there are three possible explanations for the condition. (1) The blindness may have been due to another acquired condition. (2) If the blindness were sex-linked, then she must have been homozygous for the genetic factor (with two defective X-chromosomes) and inherited one from each parent. In this case the father would be blind (*X*Y) and the mother a carrier (*X*X). Also since the defective gene would have a low frequency of occurrence as shown in the pedigree, one would expect that the marriage was consanguinous. Unfortunately no information is available regarding either parent. (3) She may have been a carrier (*X*X) in whom the recessive gene penetrated.

## SUMMARY

The pedigree of an Indian family, covering six generations, in which several of the males have been born blind, has been shown. Pathological studies of eyes enucleated from three of these males show the presence of gross developmental anomalies. Clinical examination of two other blind siblings, as well as the genetical evidence, suggests the presence here also of ocular developmental anomalies. Five female members of the family showed no ocular anomalies of any kind on examination, and reliable documentary evidence shows that with

one exception, no females were blind. The two males seen in early infancy were proved to be cases of pseudoglioma due to extensive congenital detachment of the retina, and there is evidence that the others may also have shown the clinical phenomena of this condition.

### CONCLUSION

In this family, therefore, there exists a gene causing a developmental ocular arrest, occurring bilaterally in some of the males. This has been traced through six generations and appears as a sex-linked recessive characteristic.

The author wishes to acknowledge the valuable assistance of Dr. N. Ford Walker, Dr. T. H. Hodgson, Dr. A. L. Morgan and Dr. R. N. Simpson of Manitowaning in the preparation of this paper.

### REFERENCES

1. BEER: Cited by Wetzel, J. O.: Pseudoglioma of the retina, *Am. J. Ophthal.*, 24: 164, 1941.
2. RIDLEY, F. AND SORESBY, A.: Modern Trends in Ophthalmology, Butterworth & Co., London, 1st ed., p. 398, 1940.
3. DUKE-ELDER, SIR W. S.: Textbook of Ophthalmology, C. V. Mosby Co., St. Louis, 1st ed., p. 1338, 1946.
4. MAYOU, M. S.: Microphthalmos, *T. O. S.*, 24: 340, 1904.
5. MANN, I. C.: Developmental Abnormalities of the Eye, Cambridge University Press, London, 1st ed., p. 206, 1937.

## PRIMARY RESECTION OF THE COLON IN ULCERATIVE COLITIS*

**G. Gavin Miller, M.D., F.R.C.S.[C.], Campbell McG. Gardner, M.D., F.R.C.S.[Eng.& C.] and Charles B. Ripstein, M.D., F.R.C.S.[C.]**

*Montreal, Que.*

THE surgical treatment of ulcerative colitis has never been wholly satisfactory. Earlier conservative operations such as appendicostomy have been abandoned in recent years, and it has been the practice of most surgeons to perform an initial ileostomy and follow this later with a staged resection of the colon. Ileostomy alone is seldom adequate and few cases are reported in which intestinal continuity has been restored without recurrence of the disease. When extensive pathological changes have occurred, the bowel wall never reverts to normal, and the dangers of hæmorrhage and polyposis with malignant degeneration always exist. It has been the universal experience that resection of the colon is necessary to cure the disease; and the policy of staged resection has become accepted.

In most cases a permanent ileostomy is necessary. With the development of the Koenig-Rutzen bag this has ceased to be an intolerable disability. Ravitch has recently recommended a pull-through operation which results in a continent anal stoma. This approach is promising but it is still too early to evaluate the end results.

Many surgeons have emphasized the idea that resection of the colon in ulcerative colitis should be a carefully staged procedure and have warned against radical initial operation. Despite the fact that preliminary ileostomy carries a high mortality it has been adopted as the procedure of choice.

In a recent publication we have advocated that ileostomy be combined with right hemicolectomy as an initial operation, and that this be followed in three to six months by resection of the remaining colon. We have since carried out primary resection in 24 cases of ulcerative colitis with no mortality. The procedure has become more radical in successive patients until at present we perform a one stage subtotal colectomy to the level of the lower sigmoid.

Seven years ago, one of us (G.G.M.) was forced to do a primary resection of the right colon in a very sick girl with multiple impending perforations. The result was surprising and spectacular. The patient, who had previously been extremely toxic and ill, responded in a dramatic fashion. Her temperature dropped to almost normal, she gained weight and her symptoms subsided to a considerable extent. It was not until the advent of the sulfonamide drugs and streptomycin that we felt justified in recommending primary resection as a routine procedure. We now feel that with proper pre- and post-operative care this operation can be done with a lower mortality and less morbidity than ileostomy and staged resection.

The right colon is the absorptive part of the large bowel and its removal at once eliminates the absorption of bacterial toxins. Furthermore, the diseased bowel represents an extensive source of protein and blood loss. The amount of protein excreted into the colon may be 100 to 200 gm. daily and it is difficult to maintain the nitrogen balance in the face of

* From the Departments of Surgery, Royal Victoria Hospital, Queen Mary Veterans' Hospital and McGill University, Montreal, Que.

this loss. It is thus obvious that primary resection immediately eliminates the toxæmia, anæmia and hypoproteinæmia which is so characteristic of this disease. In addition, multiple operations are avoided, and the overall mortality is lowered.

It is often unnecessary to excise the recto-sigmoid segment. In our experience the patients are usually so markedly improved following subtotal resection that they refuse further operation. We feel that the second stage is definitely indicated in cases with severe rectal involvement where bleeding continues after operation and in those cases with polyposis, stricture or anorectal fistulæ.

The technique of operation and the details of pre- and post-operative care have already been described. The essential points are as follows:

1. The entire colon to the level of the lower sigmoid is resected at one stage.

2. A terminal ileostomy is made six cm. below and three cm. to the right of the umbilicus.

3. The distal sigmoid segment is exteriorized through a stab wound in the left lower quadrant.

4. No attempt is made to invert or anastomose bowel ends. In the past, in cases where this has been done the mortality has been high, due to peritonitis.

## Results of Primary Resection

To date the operation has been carried out in 24 cases with no mortality. The results have been uniformly good and the postoperative course has been much smoother than where ileostomy alone has been done. This is due to the fact that blood and protein loss into the bowel is eliminated and toxic absorption is decreased. In two cases we have encountered the problem of troublesome bleeding from the remaining sigmoid segment, but this has subsided with conservative management.

If the fluid and electrolyte balance is maintained and infection is controlled with penicillin and streptomycin the postoperative course is usually uneventful. Improvement is much more rapid than was seen following ileostomy and the incidence of complications has been less.

We have not attempted to re-establish bowel continuity in any case. On the basis of past experience, such a procedure invites recurrence. We feel that the rectal stump should be left intact if possible as this leaves the way open for a pull through operation at some future date. Our patients have been so remarkably improved by subtotal colectomy and so tolerant of ileostomy that we have not been tempted to try such a procedure as yet.

We feel convinced that primary resection of the colon is the operation of choice in ulcerative colitis. With proper preoperative and postoperative management it carries a lower mortality and morbidity than ileostomy alone and multiple stage operations are avoided.

## Summary

1. Primary resection of the colon with permanent ileostomy is advocated as the operation of choice in ulcerative colitis.

2. In a series of 24 cases treated in this manner there has been no mortality and the morbidity has been less than with ileostomy alone.

3. The advantages of this procedure are: (*a*) Immediate removal of the diseased bowel which acts as a source of toxic absorption and contributes to blood and protein loss. (*b*) The elimination of multiple stage operations.

Since writing this article two cases have died both from hæmorrhage and infection in the remaining rectum. In one, the lower sigmoid had perforated. In neither case was immediate abdominal perineal resection attempted as the condition of the patient was deemed too poor.

## Bibliography

1. BLOCK, M. AND POLLARD, H. M.: *Gastroenterology*, **10**: 46, 1948.
2. CATTELL, R. B.: *Gastroenterology*, **10**: 63, 1948.
3. *Idem*: *Lahey Clin. Bull.*, **4**: 45, 1944.
4. CATTELL, R. B. AND BOEHME, E. J.: *Surg. Clin. North America*, **26**: 641, 1946.
5. COMFORT, M. W., BARGEN, J. A. AND MORLOCK, C. G.: *Med. Clin. North America*, **22**: 1089, 1938.
6. CROHN, B. B.: *Gastroenterology*, **10**: 67, 1948.
7. CROHN, B. B., GARLOCK, J. H. AND YARNIS, H.: *J. Am. M. Ass.*, **134**: 334, 1947.
8. DENNIS, C.: *Surgery*, **18**: 435, 1945.
9. FANSLER, W. A. AND FRYKMAN, H. M.: *Am. J. Surg.*, **76**: 713, 1948.
10. LAHEY, F. H.: *N.Y. State J. Med.*, **41**: 475, 1941.
11. LYNN, D. H.: *Surg., Gyn. & Obst.*, **81**: 269, 1945.
12. MILLER, G. G., RIPSTEIN, C. B. AND TABAH, E. J.: *Surg., Gyn. & Obst.*, **88**: 351, 1949.
13. RAVITCH, M. M. AND SABISTON, D. C. JR.: *Surg., Gyn. & Obst.*, **84**: 1095, 1947.

1390 Sherbrooke St. West.

## Résumé

Rapport concernant le traitement de 24 cas de colite ulcéreuse par la résection sub-totale d'emblée, depuis le cæcum jusqu'au recto-sigmoïde, avec iléostomie à demeure. La mortalité dans cette série est nulle; les suites opératoires sont meilleures qu'après la simple iléostomie sans résection du côlon. Les advantages de la méthode sont les suivants: ablation d'emblée d'un segment d'intestin, savoir l'hémicôlon droit, que est le siège d'une forte résorption toxique et de pertes sanguines et protéiques; suppression des opération en plusieurs temps.

PAUL DE BELLEFEUILLE

# A DIAGRAM ILLUSTRATING THE RESULTS GIVEN BY THE COPPER SULPHATE METHOD OF PHILLIPS, VAN SLYKE ET AL.

**Albert Bertrand, M.D.**

*Notre-Dame Hospital, Montreal, Que.*

THE copper sulphate method of Phillips, Van Slyke *et al.* has been the object of many comments in the last few years. Of the different papers published on the matter suffice it to mention the conclusions of two of them which nearly agree as a whole. One is by Roux, Da Sylva-Prado and Dumont of l'Hôpital de Vaugirard, Paris.[1] These authors have applied the copper sulphate method for studying 50 cases of major surgery and have come to the conclusion that it has proved to be of great interest in the detection and prevention of post-operative shock. Moreover the use of the copper sulphate method as a preoperative measure has enabled these workers not only to establish a more sound judgment on the physiological balance of the patient to be operated on, but also when repeated during the operation and on the following days, this technique has rendered possible the detection of a fall in the patient's condition even before the appearance of any clinical sign of shock, and the correction of this condition by appropriate means. The surgical aspect of this technique seems to possess a real value and according to these workers should receive the greatest support.

The other paper referred to is that of Muirhead, Grow and Walker[2] of the American Navy, who have made a very interesting study of the method. They conclude:

"The copper sulphate method for determining the specific gravity of blood and serum can be used to great advantage in the appraisal and treatment of various surgical conditions. . . . The method is of particular value in military use when several factors as, the sudden arrival of large numbers of wounded men, the necessity of rapid decision concerning the shock state, the appraisal of patients before anæsthesia and operative procedures are instituted, the need for medical judgment during attack by the enemy, make its simplicity, speed, degree of accuracy and instant application most desirable."

The well known copper sulphate method determines the specific gravity of whole blood and that of serum or plasma. By using the line chart of Phillips, Van Slyke *et al.*, one can calculate plasma protein, hæmoglobin and hæmatocrit from gravities of plasma or serum and blood. The results are expressed in grams per 100 c.c. of blood for hæmoglobin and plasma protein, and in volume per 100 of packed red cells for hæmatocrit.

The main applications of this method, as summarized by Kolmer[3] would be as follows:

(1) To assist in ascertaining the results of hæmorrhage; (2) to estimate the decrease in plasma volume, indicated by hæmoglobin increase and to decide whether the plasma volume decrease is due to loss of water (dehydration of cholera, dysentery, exposure) or to loss also of plasma proteins (extravasation in burns, trauma, etc.); (3) to assist in deciding whether blood replacement therapy requires administration of saline solutions or plasma or whole blood; (4) to follow the results of such therapy and decide whether it has been adequate and when it must be repeated; (5) if the number of cases exceeds the amount of blood and plasma available the method will assist in deciding which cases must receive it and which may be able to do without; (6) beside these acute conditions the method will assist in diagnosing the different types of anæmia and in detecting the pathological conditions in which the plasma proteins become diluted or concentrated."

Having this statement in mind and anxious to give to his patient the best possible replacement therapy, the surgeon who asks for a Phillips and Van Slyke copper sulphate determination but who receives a report labelled: plasma protein 6.5 gm. %, hæmoglobin 12 gm. % and hæmatocrit 38 vol. %, is some times perplexed in appreciating the exact meaning of these figures and has to make a mental effort to co-ordinate these findings and to establish their normal relationship. Moreover, if the next day another similar determination is made on the same patient, three more figures will have to be taken into consideration by the surgeon, with the result that he may be inclined to discard as too troublesome a method of investigation which has proved to be of great value.

For these reasons we have tried to work out a diagram to which the figures given by the line chart of Phillips, Van Slyke *et al.*, could be transferred, giving thus a graph that could be read in a moment.

This diagram consists essentially of a square divided: (1) by a diagonal going from the left lower angle to the right upper one; (2) by two lines, one parallel to the top of the square, going from left to right and reaching at a certain point the diagonal; the other, parallel to the right side of the square going from bottom to top and reaching the diagonal at a point which is the same as that of the first line (Fig. 1).

The left hand side of the square represents hæmoglobin; the bottom, the hæmatocrit and the diagonal, the plasma protein. Hæmoglobin and

hæmatocrit for men are read outside of the square, hæmoglobin and hæmatocrit for women are read inside, plasma protein both for men and women are read on the diagonal. The figures that fall between the parallel lines close to the

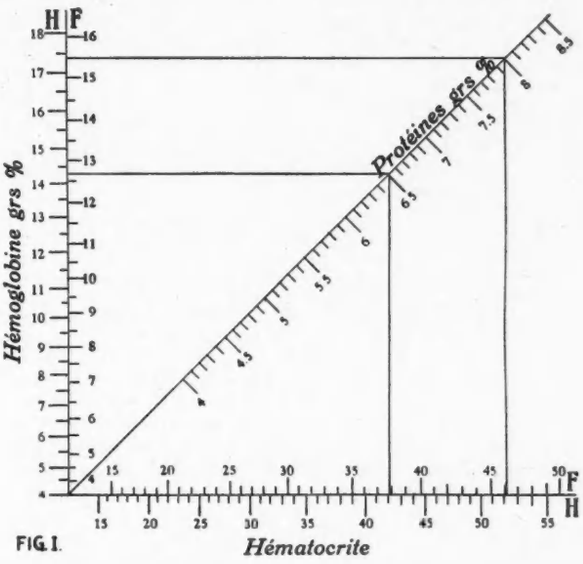


FIG. 1.

top and right side of the square represent normal findings for hæmoglobin, hæmatocrit and plasma protein.

The diagram is used in the following manner: (1) hæmoglobin, hæmatocrit and plasma protein are established by the copper sulphate method of Phillips, Van Slyke *et al.*; (2) the figures given by the line chart are transferred to the diagram; (3) straight lines are drawn from plasma protein to hæmoglobin and to hæmatocrit.

These two straight lines meeting the diagonal make an angle that may be either right, acute or obtuse. It has been presumed that if the three factors given by the copper sulphate method are modified in the same proportion they will give, when transferred to the diagram, a right angle. On the other hand hæmoconcentration will give an obtuse angle and hæmodilution an acute angle.

So a mere glance at the diagram will show whether the patient needs whole blood, plasma or saline according to the position of the lines and to the opening of the angle. After specific therapy has been instituted other lines drawn on the same diagram will indicate improvement or failure of this therapy. The graph will also indicate that in spite of whole blood therapy the patient is still bleeding.

In building the diagram, we first used the line chart of Phillips, Van Slyke *et al.* to which the figures found by Roux, Da Sylva-Prado and Dumont in their study were transferred, but it was soon realized that the graph so obtained did not agree with our conception of a normal one, a right angle in normal cases. This was due to the fact that the normal plasma protein level printed on the line chart of Phillips, Van Slyke *et al.*, was between 6 gm. % and 7.30 gm. % whereas that used by Roux, Da Sylva-Prado and Dumont was between 6.50 gm. % and 8 gm. %. These last figures being those recognized as normal by many workers we decided to use them as our normals on the diagram. Normals for hæmoglobin and hæmatocrit both for men and women are those described by Phillips, Van Slyke *et al.* and have been transferred to the diagram as closely as possible.

As may be noticed in reading the graphs reported below hæmoglobin and hæmatocrit are always modified in the same way. This is due to the fact that both hæmoglobin and hæmatocrit are read on the same line with the line chart of Phillips, Van Slyke *et al.*, and consequently will both be high or low in the same proportion according to the specific gravities of whole blood and plasma. The diagram, so constructed, though imperfect, still gives interesting results, as illustrated in the following cases.

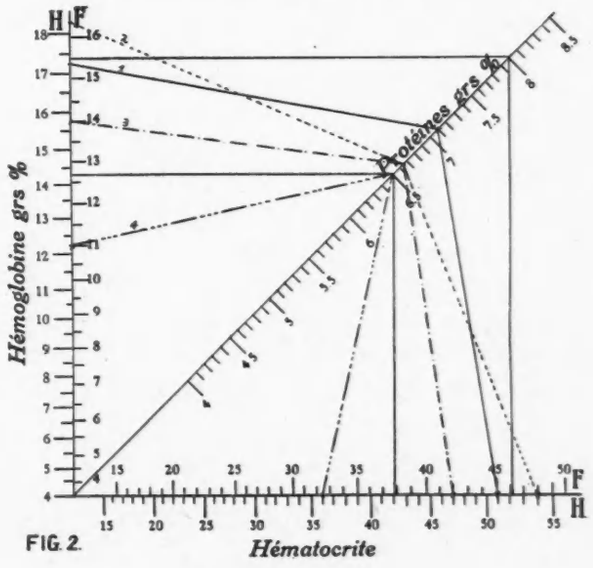


FIG. 2.

CASE 1 (FIG. 2)

Mrs. L.M., 60 years old, was suffering from a tumour of the breast. A Phillips and Van Slyke determination (as we call it for routine work) was performed November 15, 1947. With the line chart of Phillips and Van Slyke modified as to normal plasma protein level, it gives: plasma proteins 7.1 gm. %, hæmoglobin 15.3 gm. % and hæmatocrit 45 vol. %. Transferred to the diagram these figures showed that both hæmoglobin and hæmatocrit were within the normal limits. It was the same with the plasma proteins though this last factor seemed lower

than it should have been according to our conception of normal. In our opinion this patient could be operated on without any transfusion therapy. However she was given as a preoperative measure a blood transfusion. The operation was started at 9 a.m. on November 17, after the transfusion was completed. At 1 p.m. the same day the patient developed postoperative shock. At 2 p.m. a Phillips and Van Slyke determination showed hæmoconcentration, an increase of hæmoglobin up to 16.3 gm. % and of hæmatocrit up to 48 vol. % with a decrease of plasma proteins down to 6.65 gm. %. These new figures transferred to the same diagram were striking at a glance. Plasma transfusion was started immediately. At 4 p.m. the same day hæmoglobin was lowered to 14.0 gm. %, hæmatocrit to 42 vol. %, whereas the protein level remained constant (dilution of red cells by plasma without any action on protein). Meanwhile the patient's condition was improving. Plasma therapy was still continued and the next day at 11 a.m. a last Phillips and Van Slyke determination gave: plasma proteins 6.5 gm. %, hæmoglobin, 11.0 gm. % and hæmatocrit 32.5 vol. %. That morning the patient was perfectly clearminded and made a steady recovery in the following days.

These four determinations transferred to the same diagram illustrate very clearly the advantages of this procedure. Without referring to the figures one can in a moment appreciate the patient's condition and decide which therapy must be used.

CASE 2 (FIG. 3)

Mr. T.B., 48 years old, was admitted to the hospital on November 6, 1947, for a chronic peptic ulcer. On November 11, a Phillips and Van Slyke determination gave: plasma protein 6.25 gm. %, hæmoglobin 14.9 gm. %, and hæmatocrit 44.0 vol. %. These figures transferred to the diagram showed a very slight hæmoconcentration, plasma protein being a little lower than normal. It was decided that the patient could be operated on without any transfusion. A gastrectomy was performed on November 12. The next day a Phillips and Van Slyke determination gave figures higher than those observed previously: plasma protein 6.68 gm. %, hæmoglobin 15.8 gm. % and hæmatocrit 47 vol. %. These figures transferred to the same diagram showed that all three factors had increased in the same proportion. As it was reported that the patient has perspired profusely during the operation this increase of the three factors was interpreted as concentration by loss of water. On November 12, 400 c.c. of plasma and 1,000 c.c. of saline were given; on November 13, 200 c.c. of plasma were injected. At 10 a.m. on this day a Phillips and Van Slyke determination gave: plasma protein 6.29 gm. %, hæmoglobin 14.2 gm. % and hæmatocrit 42 vol. %. Transferred to the diagram these figures gave a low nearly normal graph.

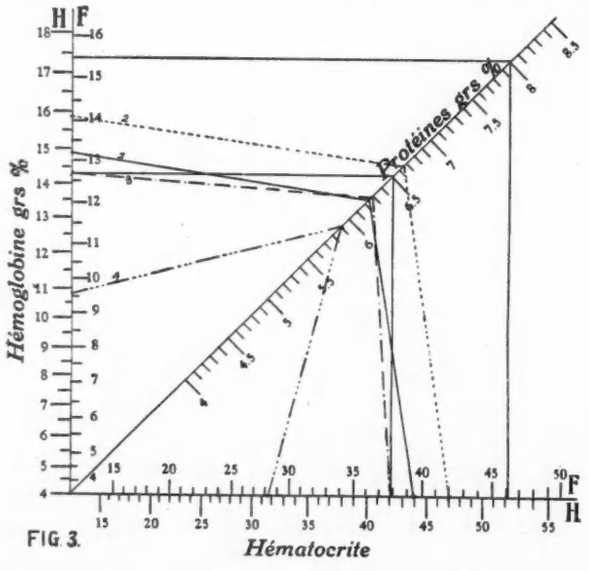


FIG 3.

From now on the patient received almost every day for a fortnight, beclysyl or saline at a rate of 500 c.c. per day. The last Phillips and Van Slyke determination was made December 5, 1947, and the results indicated a marked hæmodilution: hæmoglobin 10.8 gm. %, hæmatocrit 31.7 vol. %, with a protein level of 5.9 gm. %. These findings can be explained in our opinion, partly by the diet of the patient in the days following the gastrectomy and mostly by the amount of water injected. At all events the patient recovered and was discharged December 20, 1947.

CASE 3 (FIG. 4)

Mr. P.V., 53 years old, was admitted to the hospital on October 31, 1947, for cancer of the rectum. On November 3, blood count was: red blood cells 3,700,000, white blood cells 10,750, hæmoglobin 58% and colour index 0.8. On November 7, the patient received 200 c.c. of whole blood. On November 8, blood count was: red blood cells 3,500,000, white blood cells 6,750, hæmoglobin 58%, and colour index 0.8, suggesting continuous bleeding. On November 8, 10 and 11, blood transfusions of 400 c.c., 500 c.c. and 250 c.c. respectively were given. On November 11, the blood count was red blood cells 3,900,000, white blood cells 11,000, hæmoglobin 65% and colour index 0.8. On November 18 a Phillips and Van Slyke determination gave: plasma protein 7.2 gm. %, hæmoglobin 9.4 gm. % and hæmatocrit 27.9 vol. %, indicating marked anæmia. On November 19, after a 500 c.c. blood transfusion, hemicolectomy and ileotransversostomy were performed in the morning. At 4 p.m. the same day a Phillips and Van Slyke determination gave: plasma protein 7.2 gm. %, hæmoglobin 12 gm. % and hæmatocrit 35.5 vol. %. Apparently the patient received more blood than he lost during the operation since the graph showed an improvement in the anæmic state. Another transfusion was performed on November 20. Two Phillips and Van Slyke determinations were performed on November 20 and 21, and gave: plasma protein, 7.2 gm. %, hæmoglobin 11.4 gm. % and hæmatocrit 35.5 vol. % for the first, and plasma protein 7.2 gm. %, hæmoglobin 10.8 gm. % and hæmatocrit 32.0 vol. % for the second. These figures transferred to the

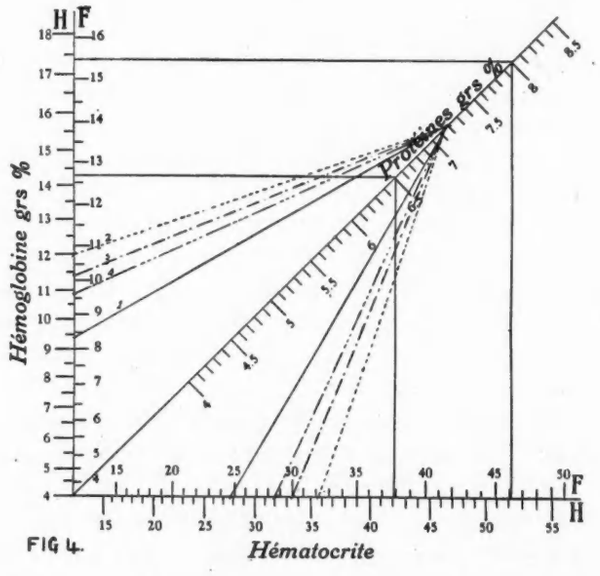


FIG 4.

diagram showed apparently little suffusion of blood following the operation. It must be considered that through the whole period of observation the plasma protein level remained constant and within the normal limits. The blood transfusions seem to have had no other effect than correcting the anæmia to a certain degree. Here the blood transfusion therapy could have been more intensive but one must always bear in mind that the heart must not be overloaded. This patient made a good recovery and was discharged on December 5, 1947.

### CASE 4 (FIG. 5)

Mr. E.R., 65 years old, suffered from an invasive tumour of the cæcum for which an operation was not indicated. As the patient was losing blood by the rectum and becoming weaker every day the surgeon decided to give supporting whole blood transfusions at few weeks' intervals. Three Phillips and Van Slyke determinations performed on November 21, December 2 and January 28, gave the following figures: November 21; plasma protein 8.0 gm. %, hæmoglobin 10.2 gm. % and hæmatocrit 30 vol. %. December 2; plasma protein 8.6 gm. %, hæmoglobin 9.1 gm. % and hæmatocrit 27 vol. %. January

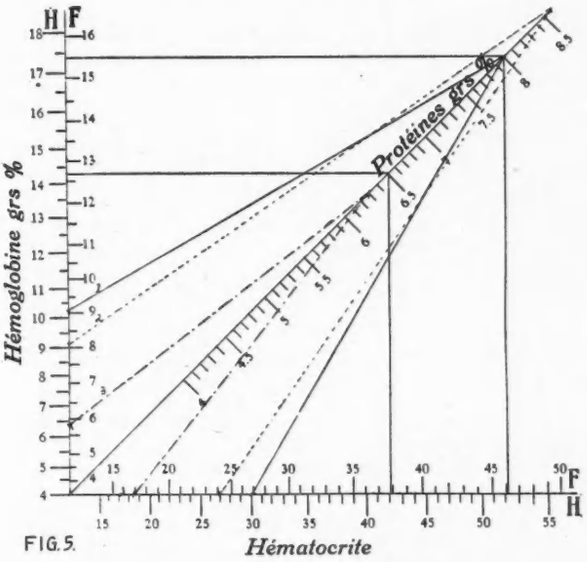


FIG. 5.

28; plasma protein 6.3 gm. %, hæmoglobin 6.4 gm. % and hæmatocrit 18.5 vol. %.

On the diagram these three sets of figures showed a very striking picture of progressive anæmia. Here the blood transfusion therapy has had no other effect than to put a certain amount of blood in an otherwise leaking system and to delay the fatal issue of the disease.

### COMMENTS

When using the copper sulphate method combined with the diagram now presented one must not expect too much of it. It must be remembered that the copper sulphate method is not a chemical determination of hæmoglobin or of plasma protein and that the figures given by the line chart of Phillips and Van Slyke may be different from those obtained by standard chemical methods. One must bear in mind too that a single determination of hæmoglobin, hæmatocrit and plasma protein made with the copper sulphate method is open to question. In fact the reliability of the method rests on the accuracy with which the different solutions of copper sulphate are made. Even if the scale is properly built, after some use the specific gravity of these solutions will change. However when serial determinations are made at hours' or days' intervals a slight modification in the specific gravity of the solutions is of less importance. What must be considered are the modifications of one graph as compared with others that follow. For this reason three or four determinations performed within a short period are of much more interest than a single one.

To be complete the diagram should include a fourth factor which would indicate the blood or plasma volume. With this last factor it would be possibly not only to appreciate the needs of the patient for whole blood, plasma or saline but to establish, at least to a certain degree, the amount of fluid required. Unfortunately at present there seems to be no practical means of such an appreciation and one must use his own judgment in deciding what amount of fluid will be necessary to bring the patient's blood volume to the normal. This seems to be the conclusion of Crook, Iob and Coller[4] who state that "the amount of blood needed in each surgical case can seldom be determined directly. Hæmoglobin, hæmatocrit and plasma protein concentrations fail as an accurate measure of this need. Plasma volume determinations are more accurate but are too laborious and time consuming for routine use. A knowledge of blood loss during operation, as available in the literature offers a practical basis for planned transfusions during operations."

With these few restrictions in mind the diagram has proved to be very useful to the surgeon in deciding the choice of replacement therapy.

### SUMMARY

A diagram is presented on to which the figures given by the copper sulphate method of Phillips, Van Slyke *et al.* can be transferred showing at a glance the needs of the patient for whole blood, plasma or saline therapy.

### REFERENCES

1. ROUX, M., DA SYLVA-PRADO, W. AND DUMONT, G.: *J. de Chirurgie*, **63**: 439, 1947.
2. MUIRHEAD, E. E., GROW, M. H. AND WALKER, A. T.: *Surg., Gyn. & Obst.*, **82**: 405, 1946.
3. KOLMER, J. A.: Clinical Diagnosis by Laboratory Examinations, first edition revised, p. 1039, 1944.
4. CROOK, C. E., IOB, V. AND COLLER, F. A.: *Surg., Gyn. & Obst.*, **82**: 417, 1946.

# TRAUMATIC RUPTURE OF THE THORACIC AORTA*

**H. K. Fidler, M.D.**

*Vancouver, B.C.*

TRAUMATIC rupture of the healthy thoracic aorta is generally believed to be of rare occurrence. It is probable, however, that it is more common than the number of recorded cases indicates. A series of 69 cases collected over a period of 6 years has recently been reported by Strassman.[1] In fatal accidents where extensive injuries to other organs and multiple fractures are adequate to explain the cause of death the aortic injury may be overlooked, particularly if the rupture is small and occurs, as the majority do, in the first part of the descending aorta. This portion of the vessel may not receive close inspection in the routine postmortem examination.

This paper deals with 54 consecutive cases of death due to violent injuries, in which rupture of the ascending thoracic aorta was found in two, and rupture of the first part of the descending aorta in eight. Battle casualties and penetrating injuries of the chest were not included and the series is made up mainly of motor accidents and cases in which there had been a fall from a height.

In both cases where the ascending aorta was ruptured, the circumstances of the accident and the presence of multiple fractures of the ribs and sternum and lacerations of the lungs provided good evidence that the aortic injury was the result of a direct blow over the precordial region. In each of the remaining eight cases, however, this was not so. The rupture occurred at, or a short distance below, the attachment of the ligamentum arteriosum in the first part of the descending aorta. This part of the vessel is relatively immune to injuries in which there is direct trauma to the chest. It lies more deeply, slightly to the left of the vertebral column and is well protected by bone and soft tissues. In none of these cases were the accompanying thoracic injuries extensive enough to provide conclusive evidence that the rupture was due to direct trauma to the thorax.

The remarkable constancy in the situation of the rupture suggests that this portion of the vessel is frequently subject to severe strain in certain types of accident. From a consideration of the anatomical principles involved and the type of injuries sustained, an hypothesis is formulated regarding the mechanism by which ruptures at this site may be produced.

### CASE 1

A male, aged 28 years, committed suicide by jumping from a fourth-floor window.

*Post mortem examination.*—There were multiple fractures of the nasal and maxillary bones. The mandible was fractured in two places and there were fractures of the left elbow and wrist, and the right femur and patella. Superficial bruises and abrasions were found over the left shoulder and elbow, the left side of the chest and the right knee and ankle.

The heart was small and weighed 255 grams. The aorta was free from disease but there was a complete transverse rupture at the level just distal to the attachment of the ligamentum arteriosum. The ends of the vessel were clean-cut and widely separated. The left pleural cavity contained about 2,000 c.c. of blood. There was some retroperitoneal hæmorrhage in the region of the right kidney but the renal artery was not closely examined. No other injuries were found.

### CASE 2

A male, aged 30 years, was killed instantly in an aeroplane take-off crash.

*Post mortem examination.*—The nose was fractured and there were multiple fractures of both legs. The first and second ribs on the right side were fractured. Many bruises and abrasions of the face, arms and legs were found.

The heart was of normal size and weighed 320 gm. The thoracic aorta showed no evidence of disease but was almost completely ruptured 1.2 cm. distal to the attachment of the ligamentum arteriosum. The tear involved the entire circumference of the vessel but, as it ran in a slightly spiral manner, the two ends were not completely separated (Fig. 1). The mediastinum was infiltrated with a large quantity of blood and the left pleural cavity contained about 1,500 c.c. of blood. There was some retroperitoneal hæmorrhage in the region of the right kidney pedicle but the renal artery was not closely examined.

### CASE 3

A male, aged 26 years, was thrown forcibly out of a jeep in a road accident and died fifteen minutes later.

*Post mortem examination.*—The only external sign of injury was a skin abrasion over the lateral aspect of the left iliac crest.

The heart was of normal size and weighed 300 gm. The aorta showed no evidence of disease but there was a transverse rupture 2 mm. distal to the attachment of the ligamentum arteriosum (Fig. 2). The two ends of the vessel were almost completely separated, being joined by a portion of intact vessel measuring only 3 mm. in width. The left pleural cavity contained about 1,500 c.c. of blood and the mediastinal tissues were tense with extravasated blood. There were tears of both renal arteries just distal to their origin from the aorta. These were 3 to 4 mm. in length, they ran in a circumferential direction in the superior aspect of the vessels and extended through the intima and about half the media. There was no bleeding into the adventitia or retroperitoneal tissues. A similar small tear was found in the superior mesenteric artery 2 mm. distal to its origin from the aorta. This involved only intima and about half the media and was 3 mm. in length. In two places the mesentery of the small bowel was torn for a distance

---

* From the Pathological Laboratory, Vancouver General Hospital.

Presented at the Regional Meeting of the American College of Physicians, Vancouver, B.C., November 13, 1948.

These cases were collected in the Royal Army Medical Corps, Middle East Forces.

of about 70 cm. along its attachment to the bowel. These two loops of intestine hung down freely into the pelvis. The peritoneal cavity contained about 500 c.c. of blood.

CASE 4

A male, aged 33 years, was crushed against a building when a heavy truck backed into him. He was dead upon admission to hospital about one hour later.

*Post mortem examination.*—The only external signs of injury were superficial skin abrasions of both arms and the head. The 1st, 7th and 8th ribs on the right side and the 1st rib on the left side were fractured. The liver, spleen and both kidneys were ruptured. There was a posterior detachment of the right side of the diaphragm and a torn portion of the right kidney lay in the right pleural cavity.

The heart was small and contracted and weighed 250 gm. There were scattered yellowish patches of atherosclerosis in the thoracic aorta. Immediately distal to the attachment of the ligamentum arteriosum there was a transverse tear 12 mm. in length (Fig. 3). About 200 c.c. of blood had escaped into the mediastinum but the pleura was unbroken.

**Fig. 1.** (Case 2).—Large rupture 1.2 cm. distal to the attachment of the ligamentum arteriosum. **Fig. 2.** (Case 3).—Large rupture immediately distal to ligamentum arteriosum. **Fig. 3.** (Case 4).—Small rupture of the aorta and infiltration of the mediastinum with blood. **Fig. 4.** (Case 6).—Small rupture 2 mm. distal to ligamentum arteriosum.

CASE 5

A male, aged 36 years, committed suicide by jumping from a fourth storey window. Death was instantaneous.

*Post mortem examination.*—There were multiple fractures of the skull, extensive cerebral lacerations and a compound fracture of the right femur. The liver was ruptured and there was a small rupture of the right lung in the hilar region.

The heart was of normal size and weighed 280 gm. There was a tear in the right auricle just at its junction with the right superior pulmonary vein. This was about 1 cm. in length and hæmorrhage from it had filled the pericardial sac with blood. The aorta showed no evidence of disease but there was a transverse tear 1 cm. in length and 1 cm. distal to the attachment of the ligamentum arteriosum. This had not penetrated completely through the wall and extended only through the intima to the middle third of the media.

CASE 6

A male, aged 41 years, committed suicide by jumping from a second-floor window. Death was instantaneous.

*Post mortem examination.*—There were extensive comminuted, depressed fractures of both frontal bones and marked laceration of both frontal lobes. The sternum was fractured at the level of the 5th rib and the 2nd to 7th ribs on the right side were fractured near their posterior angles. There were fractures of the neck of the right femur, the right pubic bone, left os calcis and a fracture-dislocation across the tarso-metatarsal joints of the right foot.

The heart appeared slightly enlarged and weighed 450 gm. Scattered yellowish patches of atherosclerosis were found throughout the entire length of the aorta. About 2 mm. distal to the attachment of the ligamentum arteriosum there was a transverse tear 1 cm. in length (Fig. 4). There was a little hæmorrhage into the mediastinum. About 1 cm. distal to this there was another transverse tear which extended only as deep as the middle third of the media and measured 12 mm. in length. The right renal artery showed a transverse tear 3 mm. in length just 5 mm. from its origin. A little hæmorrhage had taken place in the surrounding retroperitoneal connective tissues.

CASE 7

A male, aged 38 years, committed suicide by jumping from a second-floor window. He was found dead several hours later.

*Post mortem examination.*—There was an extensive compound comminuted fracture of the skull involving the left frontal and parietal bones with extensions across both orbital plates and a fracture line running into the foramen magnum. There was some superficial laceration of the left cerebral hemisphere. The 8th, 9th and 10th costal cartilages were fractured and there was a complete transverse fracture of the 1st lumbar vertebræ. The left side of the diaphragm was ruptured and the spleen and stomach lay in the thoracic cavity.

The heart was small and weighed 270 gm. The aorta showed no evidence of disease but there was a transverse rupture immediately distal to the attachment of the ligamentum arteriosum. It was almost complete and the two ends were held together by only 1 cm. of intact vessel. Hæmorrhage had occurred into the mediastinum and the left pleural cavity contained about 250 c.c. of blood.

CASE 8

A male, aged 23 years, was injured when a jeep in which he was riding overturned. The only external injuries were an abrasion and hæmatoma over the left parietal bone and a small laceration of the right elbow. He was pale, cold and cyanosed and the pulse was not palpable. One hour after the accident he coughed up some bright red froth and died suddenly.

*Post mortem examination.*—There were no fractures. The peritoneal cavity contained a large quantity of blood. There was a large tear in the right lobe of the liver and several small subcapsular tears in the spleen. Both pleural cavities contained blood. The lungs were very œdematous and congested. The right lung showed extensive subpleural ecchymoses and several small tears in the middle and lower lobes. There was a large intrapulmonary tear in the lower lobe of the left lung.

The heart was of normal size and the aorta appeared healthy. There were three transverse tears in the thoracic aorta. The first was immediately distal to the attachment of the ligamentum arteriosum and measured 1 cm. in length. A fair amount of bleeding into the mediastinal tissue had occurred. The other tears were situated 5 mm. and 3 cm. distal to the first. Each was 5 mm. in length and extended only through intima and superficial layers of the media.

In each of these cases the ductus arteriosus was obliterated and consisted only of a tough fibrous cord—the ligamentum arteriosum. In no case had this been ruptured. Paraffin sections of each aorta were cut in the region of the rupture. These were stained with hæmatoxylin and eosin and Verhoeff's elastic tissue stain. In two cases (4 and 6) there was a moderate degree of atherosclerosis, but otherwise the vessels appeared normal.

## PHYSICAL FACTORS INVOLVED IN RUPTURE OF THE AORTA

Narr and Wells[2] state that the confinement of fluid in any given space depends upon two factors, *viz.*, the strength of the container and the pressure exerted on it by the contained fluid. They conclude that in rupture of the aorta there must be an alteration in at least one of these forces. To these factors, however, I believe that another must be added. That is the actual traumatic strain which may be directed to certain parts of the aorta by virtue of its anatomical supports and attachments.

The strength of the healthy aortic wall is a fairly constant factor in adult males of the age group (23 to 41 years) into which this series falls. Whereas medio-necrosis is often associated with spontaneous rupture of the ascending aorta and arch, its rare occurrence in the descending aorta (Rottino[3]) suggests that this condition plays no part in ruptures occurring distal to the ligamentum arteriosum. In all of the eight cases reported the media appeared normal, and only in two of them was a moderate degree of atherosclerosis found. Strassman[1] observed 24 cases of spontaneous rupture of the thoracic aorta. In 22 of these cases the rupture occurred in the ascending portion and 2 in the arch. He assumed that medio-necrosis is the main feature determining the site of spontaneous rupture. In contrast to this, 40 out of 69 cases of traumatic rupture were situated just at the aortic insertion of the ligamentum fibrosum. Only 14 traumatic ruptures were observed proximal to this site. Abbott[4] stated that the aorta is congenitally weak at the aortic isthmus. As all of these ruptures occurred at, or a short distance below the isthmus this factor may be of some significance but the writer does not believe it to be of primary importance.

A sudden and momentary rise in aortic blood pressure due to a violent injury has been claimed to result in rupture of the vessel. Narr and Wells[2] state that tears following terrific blows to the chest are apparently due to the sudden transmission of the force of this blow to the confined non-compressible blood. Brahdy and Kahn[5] say that rupture is most likely to occur when the blow occurs at the beginning of the ventricular diastole when the aorta is fully distended. Klotz and Simpson[6] claim that in falls from a great height, there is an increase in blood presure due to the impact of the blood and to the doubling up and distortion of the body. They say that it is the explosive force of the contained blood that rips through the aorta whether it be normal or diseased.

In the light of these statements it should be noted that the healthy aorta is difficult to rupture by experimental methods designed to raise the blood pressure. Klotz and Simpson[6] found that pressures of 1,000 mm. of mercury were insufficient to rupture the aorta and Oppenheim[7] reports that rupture will rarely occur until pressures in the neighbourhood of 3,000 mm. are reached. The aortic valve cusps have been shown to rupture long before such high pressures are reached (Potain,[8] Bari[9]). These experiments have all been done on the cadaver. In living rabbits, Moritz[10] has shown that vessels elsewhere would give way before the aortic blood pressure becomes high enough to cause rupture of that vessel. He induced pressures of 800 to 1,200 mm. of mercury by inserting a cannula into the proximal end of the aorta and found that it resulted in rupture of the portal vein or its tributaries. The aorta could not be ruptured because of the rapid flow of blood through its peripheral circulation. From these observations it is difficult to conceive of any blood pressure which, in itself, could rupture the healthy aorta.

Whereas it cannot be denied that increased hydrostatic pressure would be a contributory factor, it seems unlikely that a momentary rise of pressure in the thoracic aorta actually does occur in many accidents where the body has fallen from a great height. If the body strikes

the ground on the caudal end, there must be a momentary *fall* in the blood pressure of the thoracic aorta because the column of blood in the aorta has been driven into the abdomen and lower extremities.

I believe that the actual mechanical strain produced by the trauma, acting either directly or indirectly on the vessel wall, may be the most important factor in rupture of the healthy aorta. As the site of predilection is either in the ascending aorta or at the ligamentum arteriosum, ruptures at these two sites must be considered separately because the mechanical factors are different.

The aortic arch is a relatively fixed portion of the vessel. It is suspended from above by its large branches and supported below by the bifurcations of the pulmonary artery and trachea. According to Reindfleisch,[11] the pulmonary artery is the chief support of the heart and aorta, achieving much of its strength of anchorage through its widespread ramifications in the lungs. The same, however, may be said of the bronchi, the left main bronchus contributing considerable support to the aortic arch.

The ascending aorta is particularly vulnerable to *direct* blows and crushing injuries over the sternum since, in addition to the hydrostatic factors which may play some part, the heart may be displaced downwards and the aorta stretched and suddenly pinched or compressed between the vertebral column and the sternum. Injuries to the ribs, sternum and other intra-thoracic structures are usually extensive although occasionally a supra-valvular rupture occurs with very little evidence of other thoracic injury. Landau[12] reports the case of a woman, aged 68 years, in which half the circumference of the supra-valvular part of the aorta was torn as the result of a motor accident. No other sign of violence to the chest was found. The aorta was said to appear healthy "if somewhat thin". No histological examination was made and in such a case medio-necrosis must remain the probable predisposing factor.

The descending thoracic aorta on the other hand, appears to be relatively immune to direct crushing injuries or blows. Owing to its position slightly to the left of the bodies of the vertebræ, it slips laterally and posteriorly to escape compression between the sternum and vertebral column. Griffiths,[13] Kleinsassen[14] and Copeland[15] describe ruptures in this part of the aorta and in view of the absence of sufficient evidence of severe trauma to the chest itself, they suggest that the injury may have been due to contre coup. Two cases of complete rupture at the junction of the arch and descending aorta reported by McDonald and Campbell[16] were considered to be due to a sudden terrific blow to the thorax resulting in both direct and contre coup forces as well as the vascular strain engendered by sudden torsion of the head and trunk.

It is thought that some of the cases in the present series throw light on the mechanism of this *indirect* or "contre coup" type of injury. When the body falls sharply on the caudal end, considerable strain is apparently sustained by the descending thoracic aorta. This may be due to the downward pull of the abdominal viscera through their arterial attachments to the aorta. Theoretically the greatest strain would come at the junction of the aortic arch and descending aorta, along the inner curvature and this is precisely the site at which all the ruptures here described have occurred. Furthermore, it appears that the ligamentum arteriosum acts as additional fixation and as a focal point between the opposing forces, with the result that rupture occurs with great regularity immediately distal to this structure.

Case 3 would seem to satisfy every part of this hypothesis. This man was thrown forcibly out of a jeep. No information could be obtained regarding the part of the body upon which he landed but an abrasion over the left hip suggests that he struck the ground here. The aorta was almost completely ruptured just distal to the ligamentum arteriosum. No other injuries were found except those in the abdomen, all of which denote severe downward displacement of the viscera. Both renal arteries and the superior mesenteric artery were partially torn just distal to their origins from the aorta, and the mesentery of two large loops of ileum was ruptured along its intestinal attachment. In this particular case it is difficult to reach any conclusion other than that severe downward displacement of the viscera caused a sharp, sudden pull on the aorta with resultant rupture just below the point of relative fixation at the ligamentum arteriosum. The other cases did not leave such clear-cut

anatomic evidences of the momentary strains that occur at the time of sudden deceleration of the body. It is reasonable to assume, however, that similar strain of sufficient degree to rupture the healthy aorta may occur in any accident where sudden caudal deceleration of the body occurs.

### Relationship Between Type of Accident and Site of Aortic Injury

An analysis of the types of accident in which these 54 cases were involved appears to give some corroborative evidence to the hypothesis that has been advanced.

There was a history of falling or jumping from a height of 20 to 40 feet in 8 cases. Four sustained rupture of the descending aorta and in one other where the aorta was intact there was a partial rupture of one renal artery. No information is available regarding the position of the bodies when they struck the ground. It may be of some significance, however, that in the 4 cases where rupture had occurred the jump had been undertaken with suicidal intent by individuals not under the influence of alcohol. The probability is that they struck the ground feet first. Of the remaining 4, two fell accidentally while heavily intoxicated and the circumstances were unobtainable in the other two.

In two diving accidents where the bodies struck the ground head first, neither had aortic injuries but one had sustained a rupture of the heart.

The remaining 44 cases were mainly street accidents (motor-car, tram, motor-cycle and train). In this group there were only 4 cases of ruptured descending aorta. There were two cases of ruptured ascending aorta and one of rupture of the heart itself. In this group of cases the exact nature of trauma was more difficult to ascertain and the actual mechanism by which the aortic injury was produced is more open to argument than in those resulting from suicidal jumping. In Case 2 the absence of severe skeletal injury of the thorax suggests insufficient direct trauma to rupture the descending aorta and the multiple fractures of both legs could have been due to sharp downward strain. In Case 3, all the injuries point to severe downward displacement of the abdominal viscera. In Case 4, it is probable that the main trauma was a crushing injury across the upper part of the abdomen. Whether this could have caused any appreciable downward pull on the aorta is debatable. The absence of severe skeletal injury to the left side of the chest renders direct thoracic trauma unlikely as a cause of the aortic rupture. In Case 8, there were no fractures but the presence of tears in both lungs suggests severe thoracic trauma and the mechanism producing the multiple ruptures in the aorta remains more obscure.

### Influence of Trauma on Disease

Although the cases described in this article and other cases recorded in the literature have been fatal, it is reasonable to believe that recovery is possible and does occur in minor ruptures of the aorta particularly if the tear has not extended through the entire thickness of the vessel wall. DeHaven[17] has collected 7 remarkable cases in which there has been survival in falls from heights of 55 to 146 feet. No clinical evidence of injury to the thoracic aorta was obtainable in these cases but both the clinical and pathological evidence is incomplete in ruling out such injuries.

A case of aneurysm at the aortic site of attachment of the ductus arteriosus is reported by Graham.[18] This 27-year old male dated all his symptoms of wheezing spells, shortness of breath on exertion and cough to 2 months following an automobile accident 7 years previously. At this time he lost several teeth, bruised his knees and received a blow on the chest. When seen 7 years after the accident a preoperative diagnosis of mediastinal tumour was made, but at operation an aneurysm the size of an orange was found filling the entire concavity of the aortic arch. This pulsated synchronously with the aorta and was thought to originate from the ductus arteriosus. No further dissection was carried out and the operation was terminated. Graham considered this to be an aneurysm of the ductus arteriosus, but it could well have been a post-traumatic saccular aneurysm at the aortic attachment of the ligamentum arteriosum.

Shennan[19] reports a case of aneurysm of the descending thoracic aorta which he believed to be of a traumatic nature. He states that when a saccular aneurysm develops at the commencement of the descending aorta, in a vessel which, to the naked eye, is healthy or approxi-

mately so, one has to find a reason for its localization, and amongst other things one has to consider trauma as a possible factor.

In view of the fact that all degrees of injury of the thoracic aorta in the region of the ligamentum arteriosum may occur without necessarily severe direct trauma to the thorax, it is advisable that the possibility of previous trauma of an indirect nature be carefully considered as a possible etiological factor whenever saccular aneurysm or vegetative bacterial endarteritis is found at this site. This consideration has important medico-legal implications.

SUMMARY

Eight cases of traumatic rupture of the descending aorta have been described. The most striking feature was the constant situation of the tear just distal to the attachment of the ligamentum arteriosum. In four of the cases the injury was sustained as a result of suicidal jumping from a great height, in three following road accidents and the last in an aeroplane crash.

The injury is not considered to be due primarily to direct thoracic trauma. Evidence has been produced which suggests that sufficient strain results from sudden caudal deceleration to cause rupture of the vessel at its point of relative fixation in the thorax when the abdominal viscera are suddenly displaced downwards, this force being transmitted to the aorta through the arterial attachments of the viscera.

As this particular part of the aorta appears to be peculiarly subject to indirect injury it is suggested that the possible factor of previous trauma should be considered in the pathogenesis of aneurysm and bacterial endarteritis occurring in this situation.

The author is indebted to Major S. C. Buck, R.A.M.C. and Major R. Mowbray, R.A.M.C. who performed the post mortem examinations on cases 7 and 8 respectively.

REFERENCES

1. STRASSMAN, G.: *Am. Heart J.*, **33**: 508, 1947.
2. NARR. F. C. AND WELLS, A. H.: *Am. Heart J.*, **8**: 834, 1933.
3. ROTTINO, A.: *Arch. Pathol.*, **28**: 377, 1939.
4. ABBOTT, M.: *Am. Heart J.*, **3**: 392, 574, 1928.
5. BRAHDY, L. AND KAHN, S.: Trauma and Disease, Lea and Febiger, Philadelphia, p. 45, 1937.
6. KLOTZ, O. AND SIMPSON, W.: *Am. J. M. Sc.*, **184**: 455, 1932.
7. OPPENHEIM, F.: *München. Med. Wchnschr.*, **65**: 1234, 1918.
8. POTAIN, P. C.: *Clin. Med. de la Charite*, Paris, 1894 (quoted by Kahn, M. H. and Kahn, S., *Ann. Int. Med.*, **2**: 1013, 1929).
9. BARIE, E.: *Rev. de Med.*, **1**: 132, 1881.
10. MORITZ, A. R.: *Am. J. Pathol.*, **8**: 717, 1932.
11. REINDFLEISCH, E.: *Virchow Arch. f. path.*, **131**: 374, 1893.
12. LANDAU, J. V.: *Bartholomews Hospital J.*, **28**: 63, 1921.
13. GRIFFITHS, S. J. H.: *Brit. J. Surg.*, **18**: 664, 1931.
14. KLEINSASSEN, LER. J.: *Ann. Surg.*, **18**: 1071, 1943.
15. COPELAND, G. G.: *J. Am. M. Ass.*, **63**: 1950, 1914.
16. MCDONALD, J. B. AND CAMPBELL, W. A.: *Am. Heart J.*, **30**: 321, 1945.
17. DE HAVEN, H.: *War Med.*, **2**: 586, 1942.
18. GRAHAM, E. A.: *Arch. Surg.*, **41**: 324, 1940.
19. SHENNAN, T.: *J. Pathol. & Bacteriol.*, **32**: 795, 1929.

## SURGICAL TREATMENT OF PATENT DUCTUS ARTERIOSUS

**Ross Robertson, F.R.C.S.[C.]**

*Vancouver General Hospital, Vancouver, B.C.*

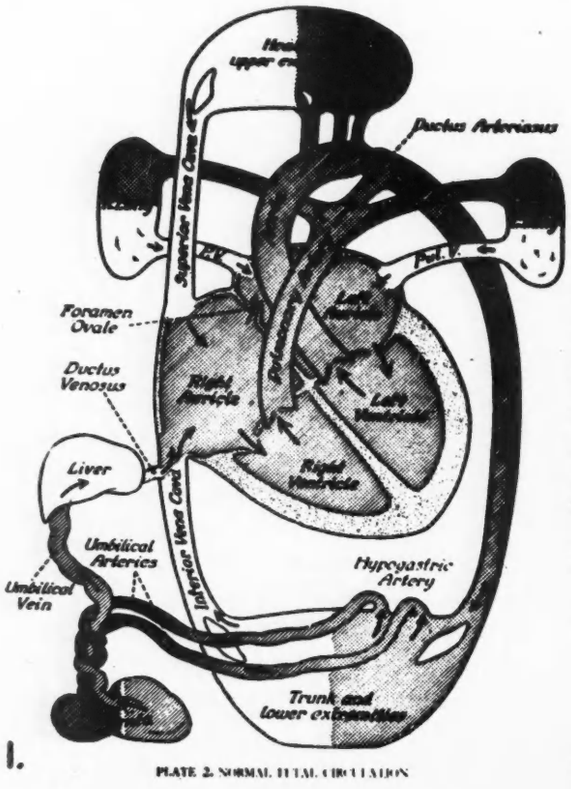
IN the fetus, most of the capillaries of the atelectatic lungs are closed to the passage of blood. As a consequence, the pressure in the pulmonary artery is above that in the aorta, and blood flows from the pulmonary to the systemic circulation, detouring the lungs (Fig. 1). When the first breath of life inflates the lungs, the pulmonary vascular bed opens, the pressure in the pulmonary artery falls below that in the aorta, and the flow of blood in the ductus is reversed.

Normally, the ductus is obliterated shortly after birth by that same mysterious constrictive process which is responsible for the closure of other segments of the embryonic aortic arches. When the ductus persists, a large volume of oxygenated blood fresh from the lungs flows back from the aorta to the pulmonary artery. It has been estimated that from 45 to 70% of the total output of the left ventricle is shunted through the ductus. This loss to the systemic circulation results in loss of energy or stunted growth unless the heart hypertrophies and increases its output proportionately.

*Diagnosis.*—Since the direction of flow in a patent ductus arteriosus is from the aorta to the pulmonary artery, unoxygenated blood does not enter the systemic arteries, and the patient does not exhibit cyanosis, clubbing of the fingers, or polycythæmia. Due to the lack of such prominent symptoms, patent ductus arteriosus frequently goes unsuspected for years. Often it is detected for the first time on routine physical examination. An observant mother may feel the peculiar præcordial thrill and consult her physician regarding its cause. The lesion is most often discovered by a conscientious doctor during a thorough examina-

tion of a child with vague symptoms of recurrent colds, lack of energy, underweight, or underdevelopment.

On examination, a systolic thrill is palpable and a typical murmur is audible over the second or third left interspace, near the sternum. The murmur is continuous, with a systolic accentuation, and has a rumbling, or machinery quality. Bacterial endarteritis is a frequent complication, its presence making the diagnosis of patent ductus arteriosus difficult as the vegetation may soften or abolish the murmur. Blood pressure readings show an exceptionally high pulse pressure of 60 to 80 mm. of mercury, with a low diastolic pressure. After exercise, this tendency is increased with



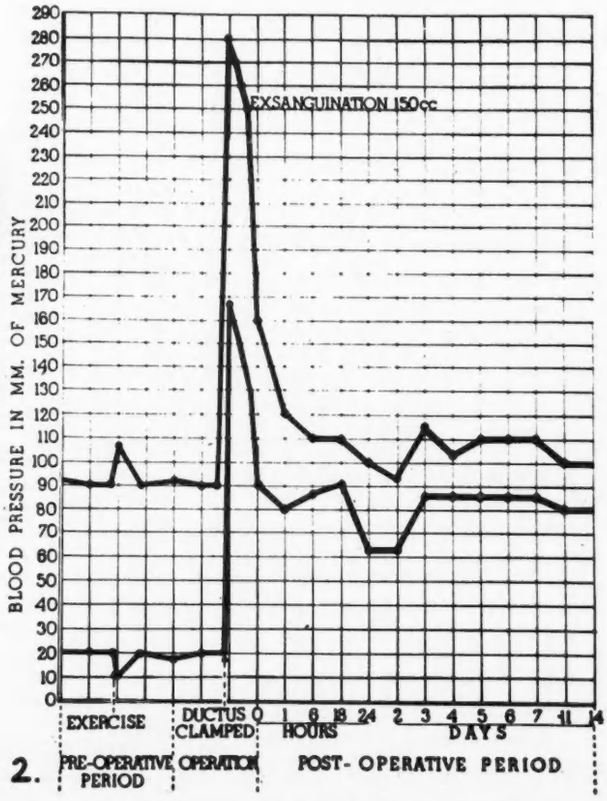




**Fig. 1.**—Normal fetal circulation. **Fig. 2.**—Blood pressure chart of a child aged seven showing response to exercise, and to closure of the ductus.

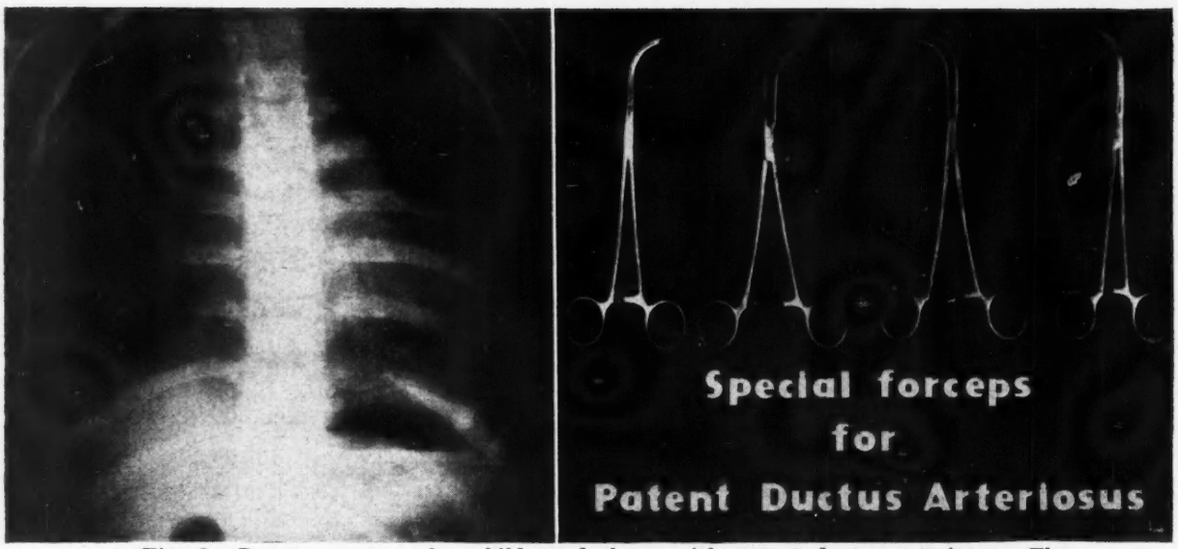



**Fig. 3.**—Roentgenogram of a child aged three, with patent ductus arteriosus. The marked enlargement of the heart and pulmonary vessels are well shown. **Fig. 4.**—Special forceps.

rise of the systolic pressure and fall of the diastolic pressure frequently to zero (Fig. 2).

The electrocardiograms are usually normal, but occasionally show some left axis deviation. Roentgenography may be negative if the ductus is small, but usually the heart and pulmonary artery are enlarged and the vessels at the pulmonary hilus prominent (Fig. 3). Under fluoroscopy, the pulsation of the hilar vessels, the so-called "hilar dance", may be visible.

*Indications for operation.* — According to Maude Abbott, the life expectancy in patent ductus arteriosus is 24 years. Shapiro and Keyes found the average age at death in 51 cases to be 25 years: 40% of these died of cardiac failure, and another 40% of bacterial endarteritis.

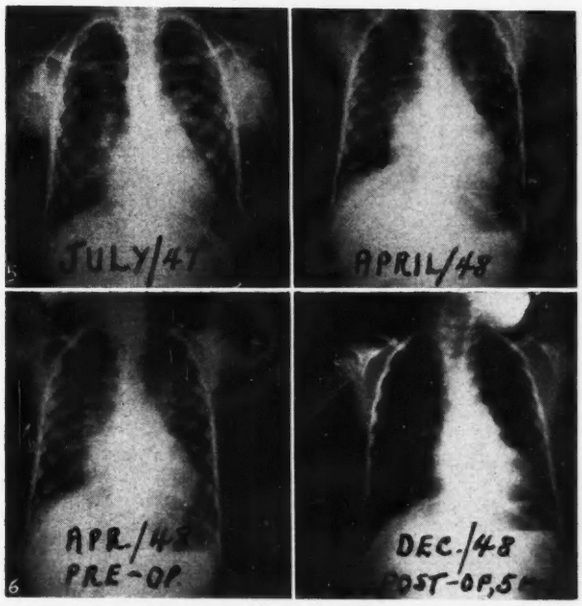



**Fig. 5.**—Roentgenograms of a child aged five, showing increase in size of the heart during a nine months' period of observation. **Fig. 6.**—Pre- and post-operative films of same child as Fig. 4, demonstrating diminution in size of heart and pulmonary vessels following operation.

A patent ductus arteriosus needlessly shunts a large volume of oxygenated blood back into the pulmonary circulation. The elevated pulmonary artery pressure increases the work of the right ventricle, and the left ventricle handles the same blood twice without gain. The stream of blood jetting through the ductus from the high pressure stream of the aorta, impinges on the endothelium of the pulmonary artery traumatizing it into fertile soil for the development of bacterial endarteritis. An operation which obliterates the ductus removes the cause of bacterial endarteritis, and brings cardiac function to normal. The operative mortality in a series of 343 cases recently collected by Shapiro was 4.8%. Gross, who pioneered the operation, reports only one death in a series of 182 patients in whom the ductus was divided and sutured. He recommends operation for all children in whom the diagnosis is reasonably certain. In adults, the ductus frequently becomes sclerotic and friable, rendering operation more hazardous. However, if there is any sign of cardiac strain, operation is indicated (Figs. 5 and 6).

Bacterial endarteritis is a positive indication for operation on a patent ductus arteriosus, for although penicillin may be effective, the endarteritis will recur unless the defect is repaired. After operative closure of a patent ductus arteriosus with endarteritis, the blood stream has been found sterile within a few minutes. In the patient with endarteritis, the diagnosis of patent ductus arteriosus is difficult, as mentioned above, unless it has been made before endarteritis developed. If the presence of a patent ductus arteriosus is even suspected, an exploration is justified. The risk of operation lies not in the exposure, but in the manipulation of the infected and friable ductus.

Operation is not indicated if there is cyanosis or clubbing. In such cases, the pulmonary circulation may be deficient usually from an associated pulmonary stenosis. The ductus is a valuable compensation in these patients, increasing the flow of blood through the lungs.

## SURGICAL TECHNIQUE

Under endotracheal cyclopropane anæsthesia, the lesion is approached through the third left interspace anteriorly. The lung is retracted laterally exposing the heart and the lung root. By palpation, the thrill can then be localized extending downwards from the aorta, in the region of the vagus nerve, to the pulmonary valve area. The mediastinal pleura is incised longitudinally between the phrenic and vagus nerves (Fig. 7). The ductus is then cleared by gentle blunt and scissor dissection. It is readily located medial to the recurrent laryngeal nerve as it winds behind the aorta. A flap of pericardial sac which usually partially overlaps the ductus from below must be separated downwards, or it may cause disastrous slipping of clamp or suture. Care must be taken to avoid opening the pericardium or leakage of pericardial fluid will obscure the field of operation.

The ductus when freed, may be compressed between a curved forceps and the index finger. The thrill will be obliterated, and the diastolic blood pressure will immediately rise to normal (Fig. 2). Occasionally also the systolic pressure will soar temporarily. In one child (Fig. 2) with a ductus found at operation to measure 15 mm. in diameter, the blood pressure soared to 280/160 following its closure. This unusually sharp rise was doubtless due to continuation of the excessively large output of the left ventricle which it had assumed to compensate for the huge ductus. As in the other cases, this pressure soon began to fall, with diminished filling of the left ventricle from the lungs. However, the fall was too slow for comfort, and fearing cardiac arrest, 150 c.c. of blood were removed from the circulation reducing the pressure to 160/90. During compression of the ductus, the patient's colour is observed carefully by the anæsthetist for the appearance of cyanosis indicating that the patient requires the ductus to compensate for an associated pulmonary stenosis. If such is the case, operation is discontinued.

There are two methods of dealing with the ductus, ligation or division and suture. Gross of Boston, who originated both methods, has abandoned ligation in favour of division because of the persistent tendency of ligated ducti to recanalize. Shapiro in his review of 343 cases reported that of those ligated, 10% had recanalized. He also found that those treated by the division and suture method never recanalized and bore a lower mortality. Blalock, however, persists in the ligation technique, using two pursestring sutures, two mattress sutures, and an umbilical tape.

Having experienced one recanalization with this method, we have adopted here the division and suture technique. Four special clamps have

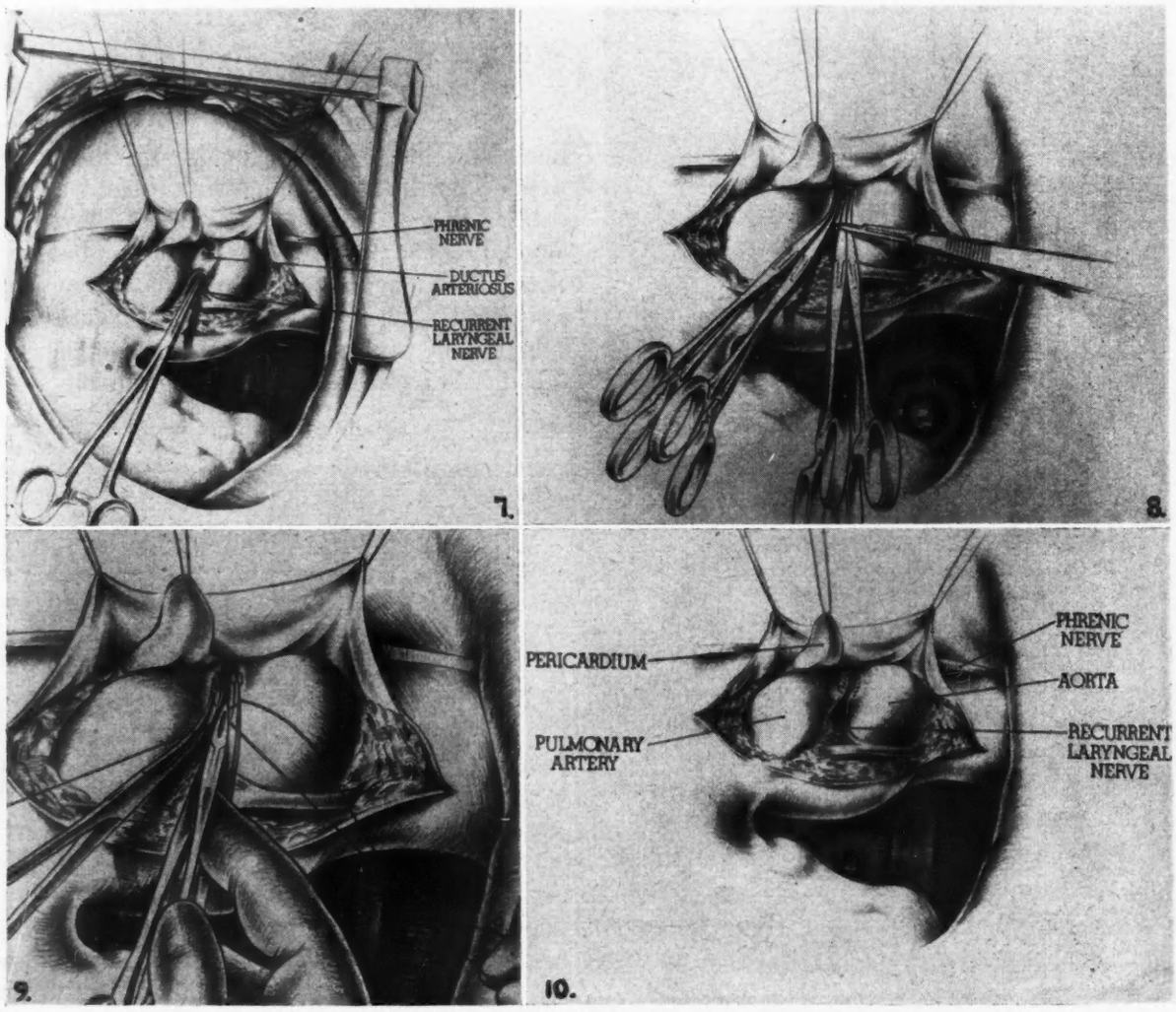



**Fig. 7.**—Curved forceps beneath freed ductus prior to compression. **Fig. 8.**—Division of ductus between special forceps. **Fig. 9.**—Suture of pulmonary end of ductus. **Fig. 10.**—Appearance of pulmonary artery and aorta after division and suture of ductus.

been devised for this purpose (Fig. 4). They are thin-bladed, so that four can be crowded on the ductus which is often no more than eight millimetres long. The blades are curved on the edge and the distal blade probe pointed for easier insertion behind the ductus. All four clamps are applied to the ductus and tightened, to the first ratchet only, to avoid undue trauma. The ductus is then divided with a sharp scalpel between two clamps on either side (Fig. 8). The distal clamp on the pulmonary artery side is then removed, leaving a narrow cuff of ductus. This is sutured with a double layer of continuous No. 5-0 black silk on a small curved atraumatic needle, No. 9. The sutures are placed 2 mm. apart (Fig. 9). The proximal clamp is then removed. The aortic stump of the ductus is then similarly dealt with, but on removal of the proximal clamp there is often a spurt of blood from the suture line. This is readily controlled by finger pressure, and after one or two minutes when the finger is removed, the suture line remains dry (Fig. 10). Apparently the platelets in the flowing stream of blood rapidly accumulate, and seal any small opening between sutures.

It is notable at this stage that the walls of the two vessels have flattened out presenting a smooth normal appearance, except for the fine suture lines. It seems reasonable to conclude that the danger of bacterial endarteritis developing here subsequently is nil.

When the operation field is dry, the mediastinal pleura is closed with fine catgut, and the chest closed with an intercostal catheter, draining under water. The anæsthetist then thoroughly aspirates the tracheo-bronchial tree, stimulating the patient to cough and re-expand his left lung automatically. A little blood and serum drains through the catheter for the next 24 to 48 hours. When this stops, the catheter is removed. Convalescence is usually smooth. The heart sounds are normal, without thrill or murmur. The diastolic pressure after the initial sudden rise in the operating room remains normal (Fig. 2). Within a few weeks, the heart size and exercise tolerance return to normal.

## RESULTS

Eleven patients with patent ductus arteriosus have been operated on with no deaths.

The first patient was a boy of 17 with a large heart and a pulse pressure of 75. The ductus was found to be about 12 mm. in diameter. At the time, it seemed safer to ligate as recommended by Blalock. Two purse string silk sutures, two mattress silk sutures, and a ligature of umbilical tape were applied to the ductus. Immediately the thrill and murmur were obliterated and the diastolic pressure rose to normal. Ten days after operation, a blowing systolic murmur appeared in the second left interspace anteriorly. Five weeks later, he began to complain of intermittent hoarseness of the voice. However, for several months the pulse pressure remained normal, and the transverse diameter of the heart diminished by 2 cm. (Fig. 11). One year after the operation, the machinery murmur reappeared, the heart began to enlarge and the diastolic pressure fell, indicating gross recanalization (Fig. 12).

The decision to operate was made with hesitation as the mortality is high for reoperation to close a recanalized ductus. In order to approach the aorta directly, the incision was made through the fifth left interspace posteriorly. There were dense fibrous adhesions about

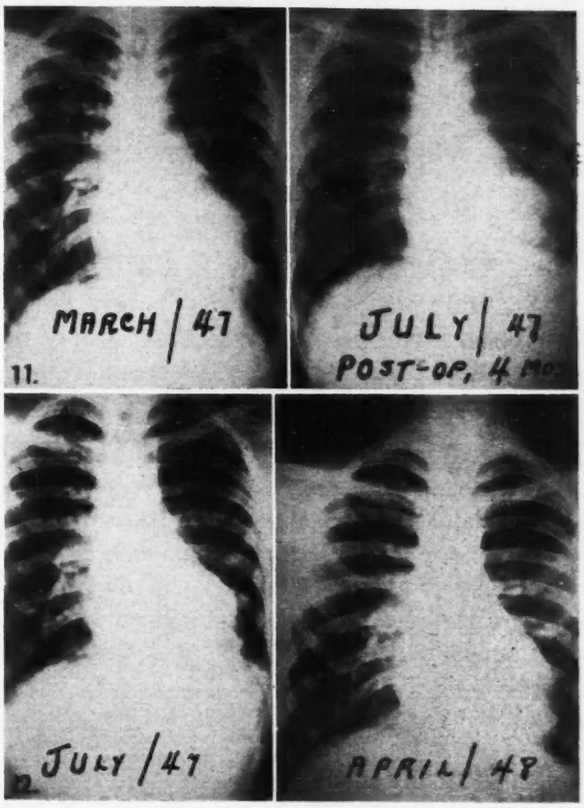



**Fig. 11.**—Pre- and post-operative roentgenograms, showing diminution in size of heart and pulmonary vessels following ligation of patent ductus arteriosus.
**Fig. 12.**—Roentgenograms showing increase in size of heart and pulmonary vessels following recanalization of patent ductus arteriosus treated by ligation technique.

the ductus. These were separated from the arch of the aorta and the dissection continued downwards close to the aorta exposing the origin of the ductus. It could then be seen that the recurrent laryngeal nerve was embedded in the ductus, apparently having been surrounded by a dissecting aneurysm. This explained the late development of hoarseness postoperatively. A pronounced thrill could be felt in this area and extending down towards the pulmonary valve. On compressing the ductus, the thrill was obliterated, and a hard knot of tissue was palpable. With considerable difficulty, the dissection was carried posteriorly to surround the ductus. The arch of the aorta about the attachment of the ductus showed a slight fusiform dilation, as though it had been pulled outwards. This extended over an area of about 5 cm. in length. The special ductus clamps were then

applied and the ductus divided and sutured as described above. On release of the proximal clamp on the aortic end there was moderate bleeding, readily stopped by finger-pressure. The fusiform dilatation of the aorta had disappeared. The operation was completed in the usual way. The postoperative course was uneventful. The murmur was no longer audible, the diastolic pressure rose to normal, and the heart gradually decreased to normal size (Fig. 13).

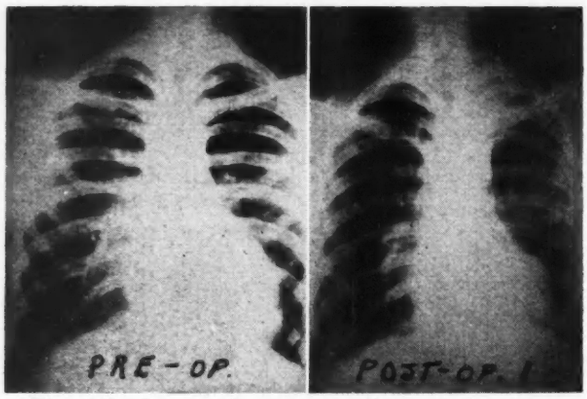



**Fig. 13.**—Pre- and post-operative roentgenograms showing decrease in size of heart and pulmonary vessels following secondary operation for division and suture of recanalized patent ductus arteriosus.

Ten additional patients with patent ductus arteriosus have been operated on, using the division and suture technique. There have been no complications.

### CONCLUSIONS

Patent ductus arteriosus is best treated by the division and suture technique of Richard Gross for two reasons: (1) Recanalization is avoided. (2) There is no *cul de sac* left in the aorta or pulmonary artery where bacterial endarteritis may develop.

This is the first report on congenital heart disease from the Vancouver General Hospital. The responsibility for the diagnosis in these patients has been largely shouldered by Dr. G. F. Strong. A further report on patent ductus arteriosus dealing with the differential diagnosis is now in the process of preparation by Dr. Strong and his associates. The satisfactory results so far obtained have been made possible by the close co-operation of various departments of the hospital; notably the Departments of Pædiatrics, Radiology, Nursing, and Anæsthesia. I am indebted to Dr. Helen Taussig for her kindness in permitting me to use Fig. 1, reproduced from her book, *Congenital Malformations of the Heart.*

### BIBLIOGRAPHY

1. ABBOTT, M. E.: Congenital Cardiac Disease; Osler and McCrae's Modern Medical Practice, **4**: 323, 1915.
2. *Idem*: Congenital Heart Disease; Nelson Loose Leaf Living Medicine, **4**: 207, 1920.
3. *Idem*: Atlas of Congenital Cardiac Disease, The American Heart Association, N.Y., 1936.
4. BLALOCK, M. E.: *Surg., Gyn. & Obst.*, **82**: 113, 1946.
5. GILCHRIST, A. R. AND MERCER, W.: *The Lancet*, 267, 1947.
6. GROSS, R. E.: *New England J. Med.*, **220**: 510, 1939.
7. *Idem*: *Ann. Surg.*, **110**: 321, 1939.
8. GROSS, R. E. AND HUBBARD, J. P.: *J. Am. M. Ass.*, **112**: 729, 1939.
9. GROSS, R. E.: *Surg., Gyn. & Obst.*, **78**: 36, 1944.
10. JONES, J. C.: *J. Thor. Surg.*, **16**: 305, 1947.
11. JONES, J. C., DOLLEY, F. S. AND BULLOCK, L. T.: *J. Thor. Surg.*, **9**: 413, 1940.
12. SHAPIRO, M. J.: *Med. Concepts C.V. Dis.*, **16**: 1947.
13. TOUROFF, A. S. W.: *Am. Heart J.*, **25**: 187, 1943.
14. TAUSSIG, H.: Congenital Malformations of the Heart, The Commonwealth Fund, p. 15, 1947.

1414-925 West Georgia St.

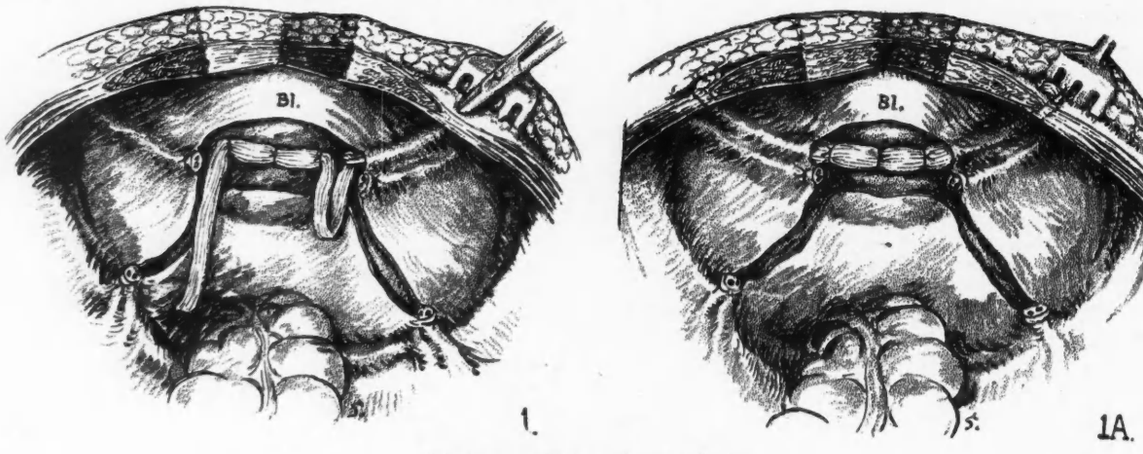
## FASCIAL SUSPENSION OF THE VAGINA*

**Norman M. Guiou, M.D.**

*Ottawa, Ont.*

A DEFINITE effort to hold up the vagina has always been a final phase of the operation of total abdominal hysterectomy. Usually the round ligaments are sutured to the vaginal vault, and similar treatment is accorded the utero-sacral ligaments. In addition, when necessary, a sound perineal floor is built up.

* From the Department of Surgery, Ottawa Civic Hospital.

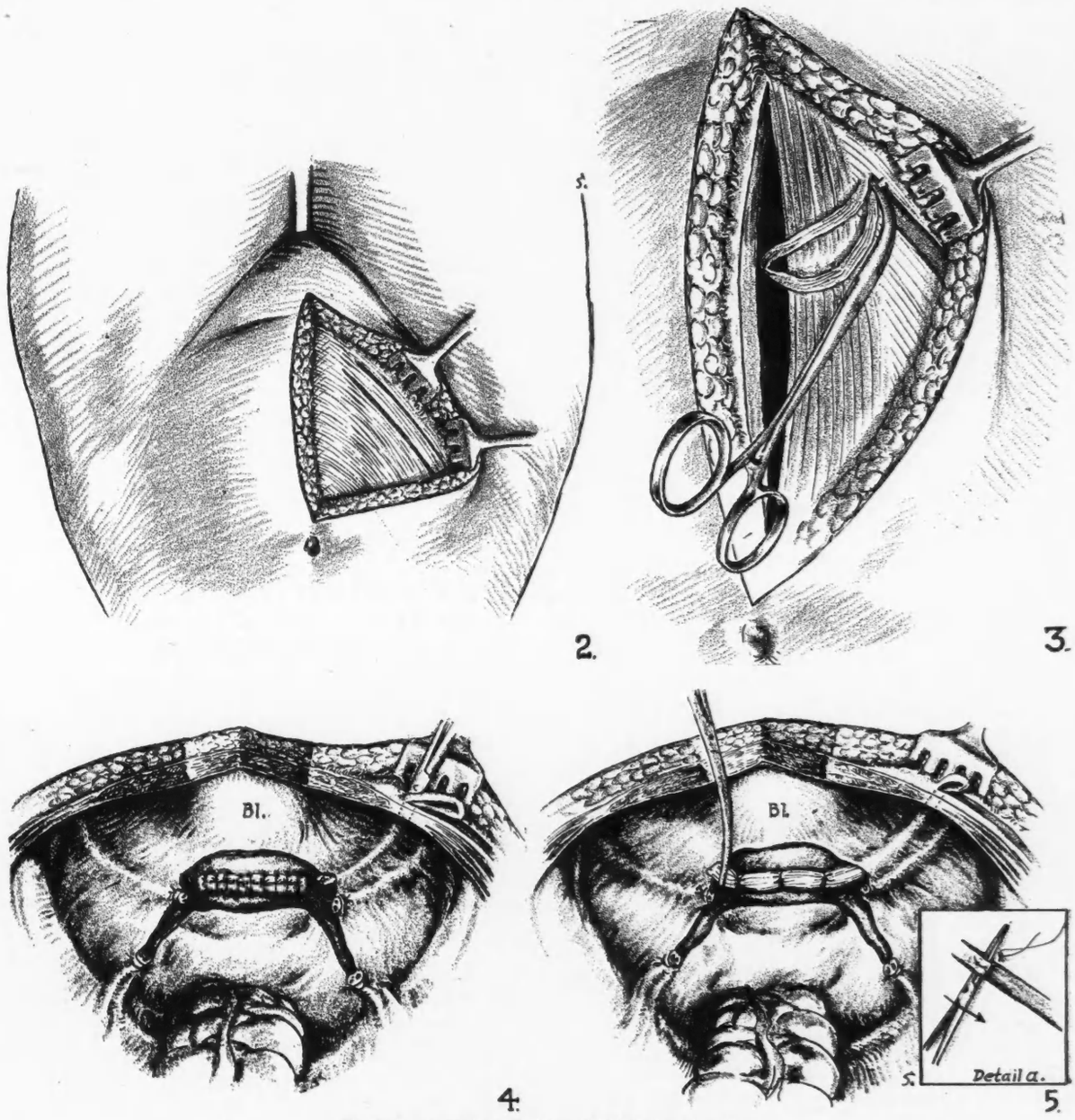



**Technique Using Fascia Lata**

**Fig. 1.**—The strip of fascia has been sewn to the vaginal vault; forceps introduced intramurally along the course of the round ligament are about to pull up one end. **Fig. 1A.**—Both ends of the fascial strip are pulled up and sewn to the abdominal aponeurosis.

These procedures are not always adequate to prevent a delayed vaginal prolapse, especially in cases where there has been some initial descensus, or the subsequent development of obesity. A more efficient method of holding up the vagina has long been the hope of the gynæcologist.

With this in view, following a total abdominal hysterectomy for fibromyomata associated with procidentia, the writer also tied the uterine artery pedicles, (which are said to contain Mackenrodt's ligaments), across the midline, and sutured them to the vaginal vault as an extra support. The vaginal vault re-




**Technique Using External Oblique Fascia**

**Fig. 2.**—A midline incision having been made, the fat is peeled and retracted laterally till a strip of external oblique fascia may be ripped with scissors in the direction of its fibres. This is done on both sides, preferably before the abdomen is opened. **Fig. 3.**—The upper end of the fascial strip is picked up in the long curved forceps and led down intramurally along the course of the round ligament. **Fig. 4.**—The fascial strip emerges beside the uterine end of the round ligament. **Fig. 5.**—The strip is picked up by a second clamp, and drawn across the vaginal vault to which it is sewn. After the procedure is repeated on the other side, any slack in the strips is taken up by passing a hæmostat under each strip and pulling it back along its bed, to the sides of which it is sutured (detail a). Sometimes we have sutured the edges of the external oblique fascia together where the strip was removed.

mained high for some months, till the patient fell down stairs, when she felt something give away. On examination, the vaginal vault was prolapsed with recurrence of the cystocele and rectocele. It was not so lax, however, as to permit of being pushed up to the anterior abdominal wall for suturing to the rectus fascia—Brady's operation. About this time, Wharton's *Gynæcology* carried a description of Grant Ward's operation—reinforcement of the round ligaments with ox fascia. We had no ox fascia, but decided to use fascia lata. Instead of running the strips under the bladder peritoneum, we decided on a simple technique adapted from Simpson-Montgomery's suspension. It seemed logical that since the fascia was to reinforce the round ligaments, it should follow along the course of these ligaments. The result was excellent, and the vaginal vault has held up for over five years.

After several cases, we tried to avoid the thigh incision by employing fascia from the abdominal wall, obtained through the hysterectomy incision. Fascia from the midline proved unsuitable, as its decussating fibres ran transversely, and the strip tended to pull apart. We then decided on strips of external oblique fascia ripped out in the direction of its fibres. This was employed in several cases. At that time, we were as yet unaware that Aldridge had previously employed a somewhat similar technique for obtaining short broad fascial strips to underlie an incontinent urethra, the technique of which is reproduced in Te Linde's *Operative Gynæcology*.

Recently, Dr. Paul R. Fletcher of St. Louis, has described an over-the-bladder technique, similar to that of Ward, employing fascial strips obtained from the *outer* part of the rectus abdominis fascia. The remarks of Dr. Norman F. Miller of Ann Arbor, in discussing Dr. Fletcher's paper, interest us considerably:

> "In his present technique, Dr. Fletcher uses fascial strips from the rectus sheaths approximately 3 cm. apart. Fascial strips taken much further apart, as from the external oblique, or more easily, as a transplanted strip of fascia lata, would, it seems to me, make a vastly better support. Thus a strip of fascia lata extending from one inguinal ring to the other, paralleling the subperitoneal course of the round ligaments, would provide good support and offer an added advantage of permitting an entirely normal direction of the supported vagina, without the possibility of interfering with bladder function."

The technique envisioned by the University of Michigan's great teacher is identical with that with which we have been "experimenting" over the past five years with satisfactory results in twelve cases. Possibly it is past the experimental stage.

SUMMARY

Fascial suspension of the vagina was introduced by Grant Ward of Johns Hopkins Hospital. It is an advance in gynæcological surgery. Fascia lata may be employed and is unexcelled, or fascia may be obtained from the abdominal wall, if it is unmarred by old incisions.

The operation is indicated in: (1) Cases of prolapse complicated by intrapelvic pathology requiring abdominal hysterectomy, the commonest example being the woman with uterine tumours and the cervix at the outlet. (2) Cases of prolapse of the vagina after total hysterectomy, where the vaginal vault cannot be pushed up to the level of the abdominal wall and sutured to the fascia.

A modification of Ward's technique is presented.

BIBLIOGRAPHY

1. WARD, G. E.: *Arch. Surg.*, **36**: 163, 1938.
2. ALDRIDGE, A. H.: *Am. J. Obst. & Gyn.*, **44**: 398, 1942.
3. FLETCHER, P. F.: *Am. J. Obst. & Gyn.*, **56**: 41, 1948.

380 Driveway.

## PROTEIN-BOUND PLASMA IODINE AS AN AID IN THE DIAGNOSIS OF THYROID DISEASE*

**W. F. Perry, M.A., M.D., C.M.† and J. B. R. Cosgrove, M.D.‡**

*Winnipeg, Man.*

THE development of reliable micromethods[1, 2] for the determination of iodine in blood has provided an additional aid in the diagnosis and treatment of thyroid disorders. The iodine has been determined both in whole blood[3, 4] and in serum or plasma,[1, 5] but the work of Salter[6] indicates that the circulating thyroid hormone resides entirely in the plasma, the red cells containing little or none.[5, 6, 7, 8] The hormonal iodine is either a part of or is bound in some manner to the plasma proteins.[9] There is also in the plasma a small variable amount of inorganic iodide which has no hormonal activity, although

* Contribution from the Departments of Medicine and Medical Research of the University of Manitoba and the Winnipeg General Hospital, Winnipeg, Canada.

†Assistant Professor, Department of Medical Research, University of Manitoba.

‡ Medical Research Fellow, National Research Council, Canada.

a recent report by Wolff and Chaikoff[10] indicates that its level may govern the rate of hormone synthesis by the thyroid. Therefore the concentration of protein-bound plasma iodine is used as an index of the amount of circulating thyroid hormone.

The normal range of protein-bound iodine has been reported to be 6 to 8.4 μgm. %,[11] 4.8 to 7.7 μgm. %,[12] and 4 to 8 μgm. %.[7, 13] Values above the normal have been found to be associated with hyperthyroidism and values below the normal with hypothyroidism[7, 11, 12, 14] and there is general agreement that the test is highly specific for the diagnosis of dysthyroid states.

The purpose of this report is to supply further data substantiating these claims and to report rare instances in which abnormal values have been found in conditions not ordinarily associated with thyroid dysfunction.

## METHOD

Duplicate 6 ml. aliquots of plasma, prepared from heparinized venous blood collected in the morning under fasting conditions were used for analysis. The proteins were precipitated with zinc hydroxide[13] and separated from any inorganic iodide by discarding the supernatant fluid resulting from centrifugation before and also after each of two washings with 50 ml. of water. The precipitated plasma proteins were subjected to the chromic acid oxidation and distillation procedure of Taurog and Chaikoff,[1] the quantities of reagents being altered to accommodate the 6 ml. amount of plasma.

The alkaline distillate of iodine was drained into a 50 ml. beaker and evaporated on a hot plate, without boiling, to a volume of about 2 ml. This was transferred with two 0.5 ml. washings to a small test tube; one drop of a dilute solution of methyl orange was added and the solution neutralized with 3N $H_2SO_4$, one drop in excess being added. Four drops of freshly prepared bromine water were added to oxidize the iodine to iodate. The excess bromine was removed by boiling, and the boiling continued until the volume in the test tube was reduced to 1.5 ml. Following cooling the tube was chilled in ice water and kept cold during the ensuing titration. One drop of a freshly prepared 0.4% KI solution was added and the resulting free iodine titrated with 0.001N thiosulfate with the aid of a microburette of the Rehberg type; one drop of 0.1% starch being used as an indicator.

With this procedure duplicate estimations agreed within 0.8 μgm. % or less. Recovery of iodine added in amounts in the range encountered, (0.3 to 0.5 μgm.) was from 87 to 105%. In many cases aliquots of the same plasma were taken for cholesterol and plasma protein determinations.

Salter[15] has pointed out that if organic iodine compounds such as priodex, lipiodol, etc., have been administered, they will act as contaminants, for they are precipitated with the protein precipitating reagents and give rise to enormously high values. They may remain in the body for long periods of time, acting as contaminants. This has been our experience also.

Basal metabolic rate determinations were measured by means of the Benedict-Roth machine. All patients were in the fasting state and the estimation was made in the morning either before rising or after 1 to 2 hours' rest. In most cases the determinations were made on the same or within a few days of the iodine analyses. Two 6 minute tests were made on each patient. If the discrepancy in oxygen consumption was greater than 5% a repeat test was carried out. In each case the lowest oxygen consumption was taken as the basal reading. The validity of this value was checked by repeat determinations on two successive days on 13 patients. The calculated rates for these days showed an average difference of 4 while the greatest difference was 11.

## SUBJECTS

The subjects of this investigation were ward or out-patients of the Winnipeg General Hospital, members of the staff and medical students. They have been divided into 5 groups on the basis of the usual clinical and laboratory criteria. Doubtful diagnoses were reviewed after 6 months when the response to specific therapy was also taken into consideration. All diagnoses were made without reference to the protein-bound iodine estimations. Any subject who had been given organic iodine compounds was rejected. The 5 groups were constituted as follows:

1. *Normal.*—A group of 34 individuals who had no evidence of thyroid disease and 28 of whom were completely normal. The other 6 were patients awaiting elective orthopædic procedures such as removal of knee cartilages. The age range was from 16 to 64 years with a sex distribution of 30 males and 4 females.

2. *Hypothyroid.*—A group of 16 individuals in whom thyroid hypofunction was diagnosed. Two doubtful cases with normal iodine values in which no final clinical assessment of thyroid status was made have been omitted. The group consisted of 12 females and 4 males, the age range being from 18 to 72 years with the exception of one cretin aged 22 months.

3. *Hyperthyroid.*—A group of 18 individuals in whom hyperthyroidism was diagnosed. It consisted of 14 females and 4 males, the age range being 17 to 70. In this group were 3 cases of recurrent hyperthyroidism following thyroidectomy, while the others had received no previous treatment.

4. *Non-toxic goitre.*—A group of 13 individuals who had enlarged palpable thyroids in whom there was no evidence of toxicity or malfunction. The age range was 21 to 73 years with a sex distribution of 12 females and 1 male. Some of the patients complained primarily of thyroid enlargement but the majority also had indefinite complaints such as asthenia for which no organic reason was found.

5. *Miscellaneous.*—A group of 32 individuals selected to represent various conditions which are detailed in Table I.

TABLE I.
DETAILS OF MISCELLANEOUS GROUP

| *Subject* | *Age* | *Sex* | *Protein bound iodine μgm. %* | *B.M.R.* | *Cholesterol mgm. %* | *Plasma protein gm. %* | *Diagnosis* |
|---|---|---|---|---|---|---|---|
| 63953 | 38 | F. | 5.7 | + 6 | 235 | 7.9 | Psychoneurosis |
| 59200 | 64 | F. | 5.2 | - 8 | — | 7.2 | Psychoneurosis |
| 64204 | 47 | F. | 8.0 | - 9 | 210 | 6.7 | Psychoneurosis |
| 9604 | 65 | M. | 3.9 | +23 | — | 7.3 | Involutional depression |
| 58092 | 33 | F. | 6.1 | - 4 | 205 | 7.0 | Anxiety neurosis |
| 16307 | 27 | F. | 11.2 | +18 | 233 | 7.1 | Anxiety neurosis |
| 49470 | 60 | F. | 8.1 | - 0 | 250 | 6.5 | Anxiety neurosis |
| 10818 | 66 | F. | 6.0 | — | — | — | Congestive heart failure |
| A1073 | 50 | M. | 6.1 | - 3 | 233 | 5.9 | Congestive heart failure |
| A648 | 46 | F. | 4.7 | +11 | — | — | Hypertension |
| 47631 | 49 | F. | 4.4 | - 5 | — | 6.9 | Hypertension |
| 15152 | 60 | F. | 14.0 | - 0 | — | 6.8 | Hypertension |
| 43656 | 68 | F. | 11.3 | - 9 | 260 | 6.8 | Hypertension |
| 64030 | 32 | F. | 4.6 | - 0 | 166 | 7.5 | Hypertension |
| A1723 | 68 | F. | 4.3 | +19 | — | 7.4 | Diabetes, Hypertension |
| A1094 | 56 | F. | 5.1 | -15 | 220 | 7.1 | Diabetes, Hypertension |
| 58880 | 30 | F. | 4.6 | -15 | 165 | — | Obesity |
| A7766 | 27 | M. | 8.1 | +18 | — | — | Cushing's disease |
| A4782 | 41 | M. | 6.0 | +13 | 166 | 7.5 | Addison's disease |
| A1737 | 22 | F. | 7.3 | + 4 | — | 7.4 | Hypogonadism |
| 63685 | 28 | F. | 10.2 | — | — | — | Pregnancy |
| A3951 | 18 | F. | 3.1 | - 8 | 510 | 3.4 | Nephrosis |
| M | 6 | F. | 2.2 | — | — | 2.8 | Nephrosis |
| A3687 | 20 | F. | 2.0 | + 0 | 336 | 3.5 | Nephrosis |
| A5799 | 48 | M. | 2.9 | -24 | — | — | Nephrosis |
| 16204 | 24 | M. | 7.4 | - 1 | 164 | 7.1 | Jaundice, infectious hepatitis |
| A582 | 54 | F. | 7.0 | -10 | 306 | 7.1 | Jaundice, carcinoma pancreas |
| 13792 | 71 | M. | 8.0 | - 0 | — | 6.6 | Paget's disease |
| 15158 | 21 | F. | 3.8 | + 9 | — | — | Hodgkin's disease |
| 4964 | 50 | F. | 7.5 | +20 | — | — | Bronchogenic carcinoma |
| 26424 | 65 | M. | 8.2 | +21 | — | — | Syphilis of liver |
| A135 | 75 | F. | 4.0 | +56 | — | 5.8 | Myelogenous leukæmia |

## RESULTS

The results relating to normal subjects and those having clinically diagnosed thyroid disorders are clear-cut. The 34 normal subjects had a mean value of 5.9 μgm. % ± 1.3 (S.D.) with a range of 4.0 to 9.3 μgm. %. The subjects at each extreme had none of the clinical stigmata of thyroid dysfunction. The 4 females in the group had an average value of 5.7 μgm. %. Age likewise did not appear to have an effect. The average value of 24 subjects between 20 and 30 years of age was 5.9 μgm. % and for 7 subjects between 37 and 64, excluding one person with the exceptional value of 9.3 μgm. % was 6.1 μgm. %.

The group of 16 hypothyroid subjects showed an average value of 1.5 μgm. % ± 1.1 (S.D.), with a range of 0.0 to 3.3 μgm. %. Within this group 3 patients with very severe hypothyroidism had no detectable protein-bound iodine. On the other hand, 7 patients with clinically less severe hypothyroidism had low values of 1.5 μgm. % or less. Six other patients clinically much like these 7 had values between 1.8 and 3.3 μgm. %. Thus the values

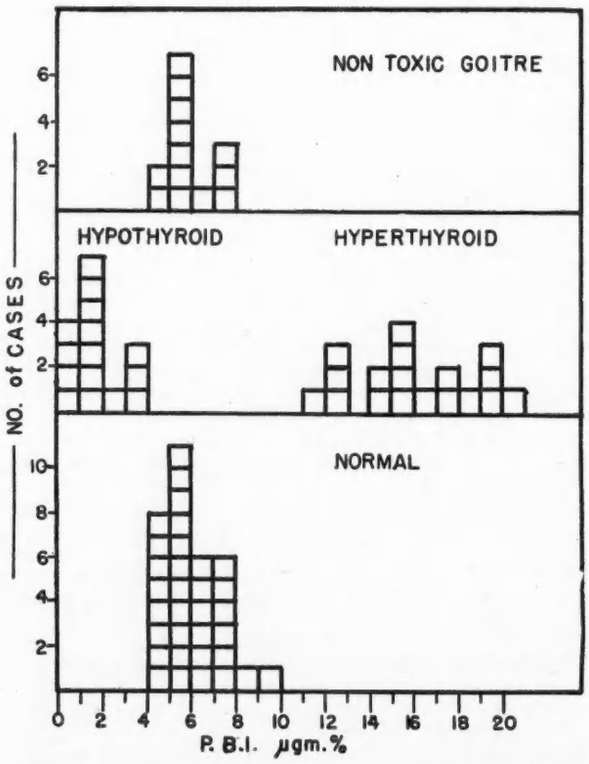



**Fig. 1.**—The distribution of protein-bound plasma iodine values in normal and dysthyroid states.

do not appear to show any clear-cut relationship to the severity of clinical manifestations. The duration of the symptoms did not have any apparent relationship to the protein bound iodine.

The group of 18 hyperthyroid subjects had an average of 15.9 μgm. % ± 2.7 (S.D.), with a range of 11.8 to 20.0 μgm. %. The 4 most toxic patients in this group had the highest values, between 19 and 20 μgm. %, and in general there was a relationship between the severity of the clinical manifestations and the

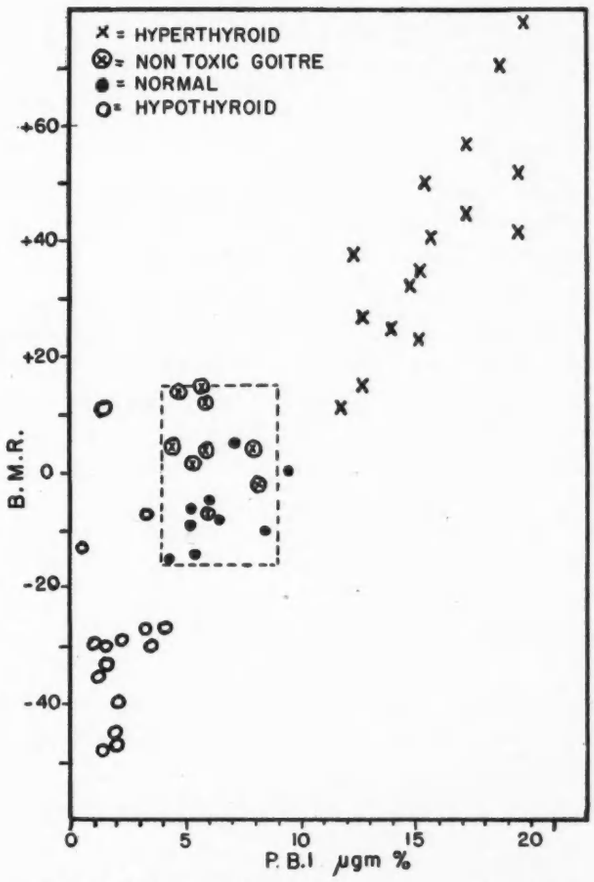



**Fig. 2.**—The relationship between protein-bound plasma iodine and basal metabolic rate.

protein-bound iodine levels. Exophthalmos was present in 7 cases and was not related to the severity of the other manifestations nor to the protein-bound iodine levels.

The group of 13 subjects with enlarged thyroid glands, but who had no evidence of thyroid dysfunction, had an average value of protein-bound iodine of 5.8 μgm. % ± 1.0 (S.D.) with a range of 4.5 to 7.8 μgm. %.

To facilitate comparison of these 4 groups the frequency distribution of the protein-bound iodine values is shown in Fig. 1. It will be seen that the peaks of incidence for the hypothyroid, normal, and hyperthyroid groups are well separated and there is no overlapping. The incidence of values in the group with non-toxic goitre is essentially similar to that found in the normal group. The asymmetrical distribution apparent in some of the groups indicates that the mean and standard deviation for the groups must be interpreted with caution.

Because protein-bound iodine determinations seemed to provide an index of thyroid function in close agreement with the clinical assessment of the cases, it was of interest to compare them with basal metabolic rates. This has been done in Fig. 2 in which the normal limits for protein-bound iodine have been set at 4 and 9 μgm. %, and for basal metabolic rate at + 15 and – 15. All normals on whom the basal metabolic rate was measured were within these assigned normal limits as were the corresponding iodine values with one exception. All 18 cases of hyperthyroidism had elevated iodine values but 2 had a basal metabolic rate of + 15 or less. The cases of hypothyroidism showed less correlation. All of these had depressed values for protein-bound iodine but 3 out of 16 had a basal metabolic rate greater than – 15.

In order to ascertain if abnormal protein-bound iodine values were present in conditions other than hypo- and hyper-thyroidism a miscellaneous group of subjects was examined. These are detailed in Table I which shows that this group displayed a wider range than the normal. Slightly elevated values were found in 2 cases of hypertension which had normal basal metabolic rates and no other indication of thyroid disease. One case of anxiety neurosis also had a slightly raised value but here the basal metabolic rate was also elevated and it is possible that mild hyperfunction of the thyroid gland may have co-existed. The value in the only pregnant individual examined was above the normal range. This has been shown by Heinemann *et al.*[16] to be typical of the condition. Low values were found in nephrosis and were associated with low plasma proteins. The single cases of Hodgkin's disease and involutional depression had values just below the lower limit of the normal range. In this group the basal metabolic rate and protein-bound iodine were often at variance.

## DISCUSSION

The estimation of protein-bound plasma iodine appears to be a very reliable aid in the diagnosis of thyroid disease; the results reported above indicate that groups of hypo- and hyper-thyroid individuals have values for protein-bound iodine clearly demarcated from normal. It is noteworthy that none of the patients with clinical evidence of thyroid disorder had a normal protein-bound iodine value. This sharp division is of obvious advantage in diagnosis and because of this the test is superior to basal metabolic rate determinations. However, it should be stressed that the subjects of this and other series have been selected and segregated into groups because they exhibited certain clinical signs. It may be that the incipient and milder forms of thyroid dysfunction are as yet not recognized and so have inadvertently been omitted. An endeavour is now being made to collect cases with borderline values and of uncertain clinical status as regards thyroid disease and to evaluate the test with such subjects.

The observation that cases of non-toxic goitre have a distribution of protein-bound iodine similar to that of normal subjects, confirms the clinical view that the functional state of the thyroid in this condition is adequate. Abnormal values rarely occur except in diseases of thyroid origin. Notable among these exceptions is nephrosis which is associated with depressed values, and presumably other conditions associated with low amounts of plasma albumen would likewise have low values for protein bound iodine. Peters and Man[17] recently have also shown low plasma albumen levels to be associated with depressed values for protein bound iodine. In addition nephrotics often have a low basal metabolic rate and elevated value for blood cholesterol.[14] However, on clinical grounds, the differentiation of such cases from hypothyroidism is usually simple. Slightly elevated values were found in 2 cases of hypertension; this parallels the findings of Curtis and Feltman[3] and Turner[4] that whole blood iodine was sometimes elevated in hypertension.

Protein-bound iodine estimations were found to agree more closely with clinical assessment than did the basal metabolic rate, and this superiority is particularly shown in the miscellaneous group. This is not surprising considering the numerous factors which influence the latter estimation. In comparison with other measurements such as serum cholesterol, pulse rate, basal temperature, plasma proteins, the iodine values were much more reliable.

## SUMMARY

Protein-bound iodine determinations were performed on 113 subjects: 18 hyperthyroids, 16 hypothyroids, 13 cases of non-toxic goitre, 32 miscellaneous conditions and 34 normal subjects.

Values for normal subjects ranged from 4.0 to 9.3 μgm. % with a mean value of 5.9 ± 1.3 μgm. %. Cases of hyperthyroidism had values above the normal range while those of hypothyroidism were below normal range. Cases of non-toxic goitre had values within the normal range as with a few notable exceptions did cases of non-thyroid disease.

The protein-bound iodine correlated fairly well with the basal metabolic rate except in diseases of non-thyroid origin.

Because protein-bound iodine levels are always abnormal in the presence of significant thyroid dysfunction and with rare exceptions normal in other conditions, it is concluded that their determination is a reliable diagnostic procedure in thyroid disease.

The work reported in this paper was carried out with aid of a grant from the Medical Advisory Committee, National Research Council, Ottawa.

The authors are indebted to Dr. J. Doupe and to Dr. L. G. Bell for advice and criticism and to Mrs. D. Court for technical assistance.

### REFERENCES

1. TAUROG, A. AND CHAIKOFF, I. L.: *J. Biol. Chem.*, 163: 313, 1946.
2. RIGGS, D. S. AND MAN, E. B.: *J. Biol. Chem.*, 134: 193, 1940.
3. CURTIS, J. M. AND FELTMAN, M. B.: *Arch. Surg.*, 50: 207, 1945.
4. TURNER, K. B., DELAMATER, A. AND PROVINCE, W. D.: *J. Clin. Invest.*, 19: 515, 1940.
5. RIGGS, D. S., LAVIETES, P. H. AND MAN, E. B.: *J. Biol. Chem.*, 143: 363, 1942.
6. SALTER, W. T. AND BASSETT, A. M.: *Trans. Ass. Am. Physicians*, 56: 77, 1941.
7. SALTER, W. T., BASSETT, A. M. AND SAPPINGTON, T. S.: *Am. J. M. Sc.*, 202: 527, 1941.
8. SILVER, S.: *J. Lab. & Clin. Med.*, 28: 329, 1942.
9. SALTER, W. T., BASSETT, A. M. AND SAPPINGTON, T. S.: *Am. J. M. Sc.*, 202: 516, 1941.
10. WOLFF, J. AND CHAIKOFF, I. L.: *J. Biol. Chem.*, 174: 555, 1948.
11. TALBOT, N. B., BUTLER, A. M., SALTZMAN, A. H. AND RODRIGUEZ, P. M.: *J. Biol. Chem.*, 153: 479, 1944.
12. LOWENSTEIN, B., BRUGER, M., HINTON, J. W. AND MEMBER, S.: *J. Clin. Endocrin.*, 4: 268, 1944.
13. MAN, E. B., SMIRNOW, A. E., GILDEA, E. F. AND PETERS, J. P.: *J. Clin. Invest.*, 21: 773, 1942.
14. DUNCAN, G. G.: Diseases of Metabolism, W. D. Saunders Co., Philadelphia, 2nd ed., 1947.
15. SALTER, W. T.: *West. J. Surg., Obst. & Gyn.*, 55: 15, 1947.
16. HEINEMANN, M., JOHNSON, C. E. AND MAN, E. B.: *J. Clin. Invest.*, 27: 91, 1948.
17. PETERS, J. P. AND MAN, E. B.: *J. Clin. Invest.*, 27: 397, 1948.

# THE PRODUCTION OF VISCERAL LESIONS FOLLOWING ATTEMPTED CHRONIC IRRITATION OF THE CENTRAL NERVOUS SYSTEM*

**M. Schachter, M.Sc., M.D.† and Ruth Schachter, M.Sc.**

*Montreal, Que.*

THE relationship of the central nervous system to lesions of the digestive tract which has in recent years become a matter of considerable experimental and clinical interest dates back to 1841 when Rokitansky[12] suggested that a relationship exists between the nervous system and peptic ulcer. Since then a large amount of experimental work of varied methods has strongly supported this suggestion.[2, 3, 4, 7, 8, 10, 13, 14, 15] However, the consistency of stimulus-response relationship which exists in simpler physiological phenomena has not been characteristic of these investigations. For example, Bazett and Penfield[1] never found significant digestive tract lesions in their decerebrate cats and none of Dandy's[5] 16 cases of 3rd ventricle tumours showed gastro-intestinal symptoms. Speranski[11] who carried out a large number of experiments involving chronic irritation of the central nervous system obtained uniform types of lesions when they did occur, but he too was able to obtain them only in a certain proportion of his animals. He regards the absence of observable lesions in some of his animals as "a difference of degree and not of form".

Despite the large amount of experimental evidence indicating that there is some connection between the central nervous system and peptic ulcer, except for Speranski,[11] there has been only the occasional reference that a similar relationship exists in regard to other parts of the alimentary canal. Watts and Fulton[14] studying the effects of hypothalamic trauma on the gastro-intestinal tract and heart in monkeys occasionally noted free blood in the large bowel with the picture of gross inflammation. Manning, Hall and Banting[9] in their studies on the production of myocardial damage following chronic vagal stimulation incidentally mention that ulcers were occasionally observed in the mouths of their dogs. Various investigations have pointed to the hypothalamus as a specific central area in the production of gastro-intestinal lesions.[2, 3, 14] Friedman and Snape[6] have recently demonstrated changes in the vascularity of the colon in young children during emotional changes.

A serious experimental approach to relationship of the nervous system to gastro-intestinal and other lesions was carried out by Speranski. The striking nature of his results and the fact that his experiments had never been repeated led us to believe that further investigation was desirable.

## METHODS

Young dogs of approximately 6 months of age or less were selected as suggested by Speranski, who states that young animals are more prone to develop "dystrophic" changes. The temporal muscle and underlying bone were exposed as ventrad as possible to render the inferior brain surface exposable. Following Speranski's technique a glass bead of approximately 6 mm. in diameter was placed intradurally between the anterior ends of the pedunculi with resulting pressure on the tuber cinereum, corpora mammillaria, and substantia perforata posterior. If severe bleeding was encountered the operation was discontinued. The relatively small size of the bead and our reluctance to excessively damage the brain did not always permit such precise localization of the bead. These instances, however, where the bead was found exerting pressure on nearby structures served as controls in evaluating the significance of the hypothalamic region as a *specific* mediator of the lesions eventually obtained.

*Results.*—Sixteen dogs were studied who survived the surgical procedure. The animals were sacrificed at varying postoperative periods depending upon evidence of gross symptoms. The postoperative intervals at which they were sacrificed varied from 4 days to over 3 months. The signs and lesions eventually obtained in some of the animals (either separately, or all in the same animal) were: bleeding and pus formation at the gingival margins with grey or black discoloration of the teeth, loss of teeth, ulceration of the buccal mucosa and lip margin, multiple duodenal ulcerations, frequent liquid stools, gross red blood in the stool, hæmorrhagic mucosa and pin-point ulcerations in the colon. The ileocæcal area was on several occasions the site of distinct hæmorrhagic foci and marked congestion. In addition, one dog developed an ileocæcal intussusception with a large ileal ulcer at the head of the intussusceptum. One dog which died 4 days postoperatively had a perforating duodenal ulcer. Figs. 1, 2, and 3 illustrate some of the above changes. Changes in parts of the bowel other than those men-

* From the Allan Memorial Institute of Psychiatry and Department of Physiology, McGill University, Montreal, Que.

† Now Assistant Professor of Physiology, Dalhousie University, Halifax, Nova Scotia.

tioned were not as prominent. The pin-point hæmorrhages in the large bowel and rectum were very numerous giving a "peppered" appearance. There was a tendency for them to

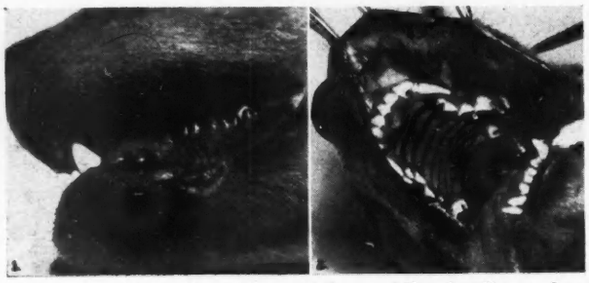


**Fig. 1.** (Dog 6).—Dog with rapidly healing ulcer at lip margin sacrificed 26 days after glass bead operation. The above lesion was bilateral and was first noted 15 days postoperatively. **Fig. 2.**—Oral cavity of same dog as Fig. 1, 26 days postoperatively, showing several healing ulcers of the buccal mucosa. These lesions were irregularly scattered over the buccal mucosa.

be situated at the crests of the mucosal ridges. Increased frequency of stools was an almost constant occurrence. Oral changes occurred in 6 of the 16 dogs and gross red blood was seen in the stools of 9. Evidence of such lesions was not observed in an equal number of dogs observed in the laboratory undergoing cardiac and gastric surgery.

**Fig. 3.** (Dog 10).—Showing microscopic section of colonic mucosa and submucosa. There are two small colonic erosions with considerable infiltration of the adjacent and intervening mucosa and submucosa. Animal sacrificed 6th day postoperatively because of passage of fresh blood in fæces.

The oral lesions were bilateral. They persisted for periods ranging from a few days to several months. The same was true for the duration of gross red blood in the stools, which usually appeared simultaneously with or shortly after the oral changes.

A review of the data suggested that lesions were more likely to occur and to be more drastic if the hypothalamic and adjacent area were exposed to pressure or damage by the bead. However, the production of visceral lesions was not restricted to those animals where autopsy revealed the bead pressure and trauma to be limited to the hypothalamic or adjacent brain stem areas. Oral and intestinal lesions were obtained in several instances where the bead had either been inaccurately placed or had slipped postoperatively from its original position so that the hypothalamic area suffered little direct trauma or pressure. In these instances the bead was found deeply imbedded in the lobus piriformis.

## DISCUSSION

The above experiments, which must be regarded as preliminary, represent an attempt to produce chronic visceral lesions following the establishment of a focus of irritation in the central nervous system. Interpretations of the mechanism of the pathological changes observed is impossible from the simple and relatively crude experiments described. However, it seems justifiable to conclude that there is a causal relationship between the pressure and trauma to the brain and the oral, duodenal and colonic lesions obtained. The hypothalamus appears to be an important area in the production of such changes but our results indicate that the mechanisms for their production may also be initiated in other areas of the central nervous system. Further experience should permit development of improved techniques for establishing chronic irritative foci in the central nervous system of experimental animals with a view to studying the mechanisms underlying the resulting damage to body tissues.

I wish to thank Professor B. P. Babkin for invaluable suggestions and assistance and also Professor D. Ewen Cameron for his interest and financial support in this work.

## REFERENCES

1. BAZETT, H. C. AND PENFIELD, W.: *Brain*, **45**: 185, 1922.
2. BEATTIE, A. J.: *Canad. M. A. J.*, **26**: 278, 1932.
3. BURDENKO, N. AND MOGILNITZKY, B.: *Ztschr. f. Neurol. u. Psychiat.*, **103**: 42, 1926.
4. CUSHING, H.: *Surg., Gyn. & Obst.*, **55**: 1, 1932.
5. DANDY, W. E.: Benign Tumours of the 3rd Ventricle of the Brain, Diagnosis and Treatment, Chas. C. Thomas, Balt. Md., 1933.
6. FRIEDMAN, M. H. F. AND SNAPE, W. J.: Editorial: *Gastro-enterology*, **7**: 574, 1946.

7. GRANT, F. C.: *Ann. Surg.*, **101**: 156, 1935.
8. KELLER, A. D.: *Arch. Pathol.*, **21**: 127, 1936a; *ibid.* **21**: 165, 1936b; *ibid.* **21**: 185, 1936b.
9. MANNING, G. W., HALL, G. E. AND BANTING, F. G.: *Canad. M. A. J.*, **37**: 314, 1937.
10. METTLER, F., SPINDLER, J., METTLER, C. C. AND COMBS, J. D.: *Arch. Surg.*, **32**: 618, 1936.
11. SPERANSKI: A Basis for the Theory of Medicine, International Publishers, New York, 1943.
12. ROKITANSKY, C.: Handbuch der Pathologischen Anatomie.
13. SCHIFF, M.: De vi motoria baseos encephali inquisitiones experimentales, Bockenheim, Frankfurt a.m. 54 pp., 1845.
14. WATTS, J. W. AND FULTON, J. F.: *Ann. Surg.*, **101**: 363, 1935.
15. WOLF, S. AND WOLFF, H. G.: Human Gastric Function, Oxford University Press, 1943.

# CASE REPORTS

## DEATH FOLLOWING THE INGESTION OF ALCOHOL IN AN ANTABUSE TREATED PATIENT

**Robert O. Jones, M.D.**

*Professor of Psychiatry,*
*Halifax, N.S.*

During the past two months Canadian physicians have been inundated with reports of the successful treatment of alcoholism by means of sensitizing the patient to ethyl alcohol by the previous ingestion over a shorter or longer period of time of the chemical tetraethylthiuramdisulfide. This preparation has been marketed under several trade names of which the best known is probably antabuse.

The original work in this subject has appeared in the Scandinavian literature and first appeared in English in *The Lancet* of December 25, 1948. This work indicated that it was possible to render patients sensitive to ethyl alcohol so that they become uncomfortably ill on drinking it. In this way the patient's tendency to use alcohol is inhibited and with the aid of psychotherapy and other psychiatric treatment, it is suggested that the alcoholism will be successfully combated. There is nothing at all in the Scandinavian literature or in the literature presented to Canadian physicians by the respective drug companies marketing this product to suggest that this is in any way a dangerous drug. It is true that one is cautioned against administering antabuse to patients with cardiovascular disease but it would appear that this caution is inserted merely because we are using a new drug and not because anyone believes that there is any danger in this particular mode of therapy.

It is suggested that this drug be used on an out-patient basis and that the patient be encouraged to take alcohol several days after he has started the drug in "the accustomed amount or until he is forced to stop". In other words, antabuse is given in a definite dose, alcohol is given in whatever dosage the patient desires and the literature would make one feel that one can safely do this in all but cardiac patients without any medical control whatsoever. The unpleasant effect of this combination is said to be due to the breakdown of ethyl alcohol to acetaldehyde, this latter substance being directly responsible for the patient's very uncomfortable reaction. This point is of some importance because it would appear that the severity of the reaction should depend on the amount of alcohol taken, that is, the factor which is not controlled at all in the usual instructions for carrying out this type of treatment.

The first suggestion that the situation was not quite as happy as that pictured came in an article in this *Journal*[3] by Drs. R. G. Bell and H. W. Smith, who reported very severe reactions following antabuse therapy. (Unfortunately this issue of the *Canadian Medical Association Journal* only reached us a few days after our experience to be reported.) This article was accompanied by an editorial written by Professor J. K. W. Ferguson pointing out that the reactions following antabuse-alcohol were much more severe than previous literature had led one to suspect, that once the reaction had started there was no known method of controlling it and under certain circumstances this reaction might constitute a real danger to life. The case to be reported bears out Professor Ferguson's warning.

A 29-year old white male was admitted to the psychiatric service of the Victoria General Hospital on February 12, 1949, for the treatment of alcoholism. His history disclosed that in the three years since his discharge from the armed services he had been using alcohol of all varieties in ever increasing amounts. This had become a serious problem over the six months previous to admission, when he had had several bad bouts of drinking and behaved in a way which threatened both his business success and his marriage. Both he and his wife felt that it was imperative that he give up the use of alcohol and were anxious to co-operate in any treatment which offered any hope of success.

Further history revealed that this man was suffering from a definite anxiety state with occasional anxiety attacks and constant feelings of tension, poor sleep with anxiety dreams and an increasing difficulty in forcing himself into public situations which was demanded of him by his job. Shortly before admission he had been drinking rather heavily so that at the time of admission he was more tense and jittery than usual and his sleep was very disturbed.

His past history disclosed that these symptoms had developed while in college before the war but had become

increasingly worse in 1945 while serving with the Canadian Army in France. At this time he had been invalided to England with "battle fatigue" and had been utilized some time after that as a training sergeant before discharge from the army. At the time of his discharge his medical examiner reported a chronic dacryocystitis but beyond this his physical examination was completely negative. His Pulhems scores were all ones with the exception of the stability score. Despite this record of instability, psychiatric investigation also revealed a number of assets in his personality which it was felt could be worked with therapeutically and it was my feeling that if he could be off alcohol for a time, the possibilities of rehabilitation were good.

Physical examination showed a young man who was obviously tense and tremulous but otherwise appeared to be in good health. A right dacryocystitis was present. The only other positive finding was an initial blood pressure of 180/110. It was felt that this finding was accounted for by his very tense state at the time of examination and on the following day his blood pressure was recorded as 132/84 and remained at this level on several other occasions while he was in hospital. Beyond this finding, examination of the cardiovascular system was entirely negative, as was the examination of the other systems of the body. Laboratory studies showed a hæmoglobin of 100%, a red cell count of 5,100,000, a white cell count of 6,800. Blood Kahn was negative, urine was clear. He was seen in consultation by an ear, nose, and throat surgeon who advised operative treatment of the dacryocystitis during his course in hospital.

Since this man was obviously recovering from a recent drinking bout it was thought that our first duty was to aid this with supportive treatment. He was therefore given sedation for the first few nights in hospital and immediately started on large doses of vitamins for the first four days. At the end of this time his tremor had disappeared, he was sleeping well without sedation and he expressed himself as feeling better than he had felt for a long time. During this time and in the days to follow an effort was made to explore the emotional causes of his drinking and it appeared that good progress was made. He was kept on maintenance dosage of vitamins during this time and no other medication was given until his eleventh day in hospital when antabuse started. Before initiating this treatment the matter was discussed with the patient and his wife. They had recently read an enthusiastic article in the lay press regarding treatment of this kind so were only too willing to give their consent. The antabuse used was part of a bottle supplied by the manufacturers to the psychiatric service for clinical trial. On February 23, the patient was given two grams of antabuse and on the following three days he received one gram each day with one-half gram on the fifth day. That is, up until the time of taking alcohol he had received five and one-half grams of antabuse. The final one-half gram given the morning of the actual taking of the alcohol probably played no part in the result described. On the third day that the patient was on antabuse his dacryocystitis was treated surgically under local anæsthesia. Since one knew that he might vomit following the ingestion of alcohol, in consultation with the ear, nose and throat specialist it was decided to wait an extra day before testing out the patient's reaction on drinking. Thus he received on extra day of antabuse before alcohol was given to him, so that his prealcoholic dosage was a gram more than the four and one-half grams recommended by the manufacturers.

About 9.15 on the fifth morning the patient was given one ounce of rum. Within fifteen minutes he became very flushed, perspired freely and was nauseated. He went to bed and a few minutes later complained of severe abdominal pain, had a chill about an hour after taking the rum and vomited a large amount of brownish fluid. Following the vomiting he felt better but remained in considerable discomfort. At this time the nurse who was with the patient asked the intern to visit him but there was no real feeling of alarm. At about 11.10 a.m. I examined the patient. At that time his condition corresponded very closely with that described in the literature on antabuse. The face, sclera, upper limbs and chest were intensely red. The patient complained of headache. The pulse rate was 110 and the volume and the quality of the pulse was good. Respiratory rate was slightly raised to 24. As mentioned, the patient had vomited some twenty to thirty minutes before. The literature states that following vomiting, the intense flushing is apt to be replaced by pallor but this certainly did not occur in our case. Both nurse and patient stated that he was much more comfortable and the nurse felt that his condition was much better than it had been one-half hour before. My feeling was that this man was having a very strong reaction but there was nothing alarming in his condition. This feeling was confirmed by consulting the literature and finding that the patient appeared to be having the usual reaction described after moderate ingestion of alcohol. At this time, his vomiting had ceased and he felt sleepy. He was able to assist the nurse in changing his bed and changing his pajamas and then began to drop off to sleep. This again seemed to correspond very closely with the reported results of antabuse, namely that after one to two hours the greatest severity of the reaction passed and the patient frequently slept for a few hours to awake feeling refreshed.

At 11.30 a.m. the patient was sleeping peacefully with a pulse of 88 and a respiratory rate of 24. The nurse went about her duties of cleaning up the room, taking out the dirty linen, etc., feeling that he was definitely over the worst of the effects of his treatment. A few minutes later the patient was visited by the floor nurse on her routine rounds for temperature and pulse. Because he was sleeping, he was not awakened for temperature but his pulse was eighty and his respiration 24. There was nothing about his condition at that time to suggest anything alarming. During the next five to ten minutes the usual routine of the floor went on, the patient being checked on occasionally by several members of the staff. At 11.40 a.m., that is about two hours and twenty-five minutes after the original alcohol was given, the intern observed that the patient had ceased breathing and was pulseless and cyanosed. Artificial respiration was immediately started, stimulants given including a direct injection of adrenaline into the heart muscle. All of these measures proved of no avail in re-establishing the patient's vital functions.

*Post mortem examination* (performed by Dr. R. P. Smith, Professor of Pathology, Dalhousie University, about two hours after death).—Face very congested and cyanosed. No pathological findings in the respiratory tract or pericardium. Lungs: no œdema, pneumonia or undue congestion. Pericardial sac: slight excess of free serous fluid. The heart weighed 14½ oz. and showed a slight hypertrophy of left ventricle and auricle with a slight incompetence of mitral valve, admitting 3 instead of the normal 2 fingers. Right auricle and ventricle were markedly distended with dark largely fluid blood. Tricuspid valve admitted 4 fingers instead of the normal 3. All the valves were healthy. No evidence of atheroma of coronary or narrowing of their orifices or thrombosis.

The stomach was distended and its wall showed some acute gastritis with petechial hæmorrhages and mucus. Contents smelled of stale alcohol and were blood stained.

The liver weighed 4 lb. 10 oz., was definitely enlarged and showed some fatty infiltration and congestion. The spleen was slightly enlarged, dark and congested, with prominence of Malpighian bodies, weight 6 oz. The kidneys (7½ and 6½ oz.) were dark and congested and somewhat enlarged but showed no special abnormal change. Pelvis of right was slightly injected and contained some purulent urine.

The brain showed a very marked œdema of the vertex and somewhat posteriorly especially on right. Nil of note found. All other organs and tracts were carefully examined, but showed nothing of note

### HISTOLOGICAL EXAMINATION

Myocardium (left ventricle, septum).—Some cloudy swelling and marked fragmentation of myocardial muscle fibres.

Stomach.—Marked acute gastritis with punctiform hæmorrhages.

Lungs.—Some acute congestion with some hæmorrhage into a few of the alveoli with numerous heart failure cells present. No œdema or infection.

Liver.—Profound peripheral and mid-zonal fatty infiltration with some congestion.

Spleen.—Prominence of Malpighian bodies and marked acute congestion with hæmorrhages into splenic pulp.

Adrenal.—Nil of note.

Kidneys.—Cloudy swelling, and marked acute congestion of glomerular capillary, afferent and efferent arterioles and intertubular arteries. No myohæmoglobin casts in tubules.

Brain.—Basal ganglia, cortex, pons, medulla, cerebellum, all show no abnormal change except some congestion of meningeal vessels.

Chemical examination.—(Carried out by Dr. E. Gordon Young, Professor of Biochemistry, Dalhousie University.)

Blood analysis.—An unavoidable delay of 48 hours occurred between the time of death and the institution of this analysis. However, a sample of blood was removed at autopsy and kept in the refrigerator in a stoppered tube. The content of ethyl alcohol was determined by the method of Henry *et al.* (1948) in a Coleman spectrophotometer. It was found to be at a level of 30 mgm. per 100 ml. of blood. This low concentration was to be expected on the basis of the amount of rum ingested.

The content of acetaldehyde was determined by the method of Stotz (1943) on the protein-free blood filtrate subjected to double distillation. The standard curve was made on redistilled paraldehyde. Acetaldehyde was present at a level of 0.86 mgm. per 100 ml. of blood. This value is high compared with those recorded by Hald and Jacobsen (1948) on the ingestion of 40 ml. of ethanol after 1.5 gm. of antabuse on the previous day. It should be noted that this dose is considerably lower than the total amount of 5½ gm. ingested in the present case. The Danish workers record acetaldehyde in blood reaching its highest concentration of 0.5 to 0.7 mgm. per 100 ml. of blood in about an hour and confirm its rapid elimination. Yet the value of 0.86 mgm. in this case was found by the same method 2 hours after the ingestion of the alcohol prior to death and 48 hours after death. This must indicate a much higher level in the blood *at the time of death* than has previously been observed and suggests that acetaldehyde may have been the cause of death by respiratory failure due to poisoning of the respiratory centre or possibly as the result of myocardial poisoning.

Work is proceeding on the estimation of tetraethylthiuramdisulphide in the various organs to determine its distribution.

### COMMENT

As soon as this death occurred every effort was made to obtain all the information possible. Immediate check was made on the amount of rum given. Fortunately a new bottle had been used and by actual measurement, it was determined that not more than one ounce had been taken from it. The rum was later analyzed by Dr. Young who found that it contained 43.3% by volume ethyl alcohol. No trace of methyl alcohol was detected.

As mentioned previously, the antabuse tablets came from stock supplied by the manufacturers and no others were available in the hospital at the time. There therefore cannot be any doubts as to the dosage of both rum and antabuse that were used. Dr. Young also examined the antabuse and I quote his report. "The average weight was 0.57 gm. per tablet. On extraction with warm ethanol the filtrate yielded yellowish crystals which had a characteristic odour and melted sharply at 70° C. in agreement with the recorded melting point of pure tetraethylthiuramdisulphide. The insoluble residue gave a positive iodine test for starch. The average amount of antabuse recovered per tablet was 0.43 gm."

It would appear then that this is the death of a young healthy male following a reaction which resulted from one ounce of rum after having previously been desensitized with antabuse. The amount of alcohol used in this case was much smaller than usually recommended, the amount of antabuse taken before alcohol was perhaps one gram more than that customarily given because of the extra day allowed for the eye operation. The reaction observed over the two hours following the ingestion of alcohol was that reported as being moderately severe. Apparently this reaction had begun to wane and the patient appeared to be in the sleepy stage when it was felt that any danger was passed, but during this sleepy stage some two and a half hours after the ingestion of alcohol, respiration apparently ceased and the patient died.

Post mortem examination left no doubt as to the cause of death, namely an acute congestive right sided cardiac failure but gave little indication as to why this cardiac failure should have occurred.

Chemical analysis of the blood showed a low concentration of alcohol (30 mgm. per 100 ml. of blood). Compare these values with the statement of Jacobsen and Martensen-Larsen. "In the sensitive individual, mild symptoms may occur when the blood alcohol concentration is increased as little as 5 to 10 mgm. per 100 c.c. The symptoms are fully developed at 50 mgm. per 100 c.c., and unconsciousness usually results when the blood alcohol level reaches 125 to 150 mgm." There was an extremely high level of acetaldehyde (0.86 mgm. per 100 ml. of blood.) Considerable time elapsed before this blood sample was done. The biochemist suggests that the actual value at the time of death was probably much higher, and that this acetaldehyde

value may have been responsible for the cardiac failure. A search of the literature shows practically no information regarding the toxicity of acetaldehyde so the above must remain a conjecture. There is also nothing to explain why this blood acetaldehyde should be so high. Excretion like that of formaldehyde evidently occurs through the lungs but nothing has been found to explain this high concentration of acetaldehyde either in terms of the amount of alcohol given or in anything which would hinder the excretion of this substance.

It would appear then that the facts as to the cause of death are clear, but why they occurred is completely unexplained. For practical purposes however, I feel that the following statements can be made: (1) That our experience emphatically bears out the statement of Professor Ferguson in his editorial in the March issue of the *Canadian Medical Association Journal*. (2) That the combination of tetraethylthiuramdisulfide and ethyl alcohol may produce a reaction of great severity and of fatal termination. (3) At the present moment, no explanation can be offered for the severity of the reaction in this patient. (4) Treatment of alcoholism with tetraethylthiuramdisulfide must be considered a procedure far from free from danger and if it is to be used should be carried out only in hospital surroundings with very small doses of both tetraethylthiuramdisulfide and alcohol and with all the facilities at hand for emergency resuscitation. (5) The patient receiving such treatment must be carefully observed, not only during the period of the acute reaction but for a number of hours afterwards until he has completely recovered. It would seem to be very unsafe to give this drug to patients on an outpatient basis where the patients can take as much alcohol as they desire and where there are no facilities for dealing with emergency.

The author expresses his thanks to Dr. R. P. Smith, Professor of Pathology, Dalhousie University and to Dr. E. G. Young, Professor of Biochemistry, Dalhousie University for the interest and co-operation in investigating this case. Dr. J. Jewell of Ayerst, MacKenna and Harrison has also been most helpful in putting a good deal of unpublished literature at my disposal and in giving every co-operation in attempting to find an explanation for this result.

REFERENCES

1. HALD, J., JACOBSEN, E. AND LARSEN, V.: *Acta Pharm. et Toxicol.*, 4: 285, 1948.
2. HALD, J. AND JACOBSEN, E.: *Acta. Pharm. et Toxicol.*, 4: 305, 1948.
3. BELL, R. G. AND SMITH, H. W.: *Canad. M. A. J.*, 60: 286, 1949.

## COLD AUTO-HÆMAGGLUTINATION*

**G. M. Moffatt, M.D.**

*Halifax, N.S.*

Cold auto-hæmagglutination is a condition in which the patient's serum agglutinates his own red blood cells. The agglutination is independent of the blood groups, is optimum at 0 to 5° C., diminishes with a rise in temperature and is no longer demonstrable at 37° C. Cold agglutination was first clearly described by Landsteiner in 1903 who noted its occurrence in animals. Christy reported the frequent occurrence of agglutination in trypanosomiasis in man. Clough and Richter in 1918 reported the first cases of cold agglutination in human beings. Since 1918, this phenomenon has been described in many conditions, notably in association with various blood dyscrasias, liver diseases, in allergic and peripheral vascular disorders. During the last decade, many observers have reported and studied the regularity with which a high titre of cold agglutinins is found in primary atypical pneumonia. In this case, the cold agglutination phenomenon was noted in the course of collecting routine samples of blood. Each time a sample of blood was taken from the patient, the red blood cells clumped in the syringe while the needle was still in the vein.

Mr. F.C., aged 69, a bookkeeper, was admitted to the Victoria General Hospital on May 4, 1948, complaining of weakness. The patient always enjoyed good health until February, 1947, when he had "an attack of influenza". The symptoms of influenza subsided without chemotherapy but there was marked weakness, greater than one would expect from a post-influenza asthenia. Following the illness, he was too weak to return to work until August, 1947. He worked the latter part of 1947, but, during a cold spell in January 1948, the weakness returned rather suddenly and he noted that he was jaundiced. The weakness and a mild icteric tinge persisted until his admission to this hospital in May, 1948. From the onset of his illness, the patient took folic acid, iron and liver injections. When his weakness failed to improve on intensive therapy with different combinations of these drugs, his physician considered giving him a blood transfusion but he was unable to find a compatible donor. On the hospital admission form, the physician stated "He is type I AB and donors of his same group were found to be incompatible".

There was no family history of jaundice or pallor and the patient's personal history was non-contributory.

On physical examination, the patient appeared to be his stated age and of fair nutrition. The skin and scleræ were slightly icteric. The liver was just palpable below the right costal margin and spleen was 3 to 4 cm. below the left costal margin. The axillary

* Department of Medicine, Victoria General Hospital, Halifax, N.S.

and epitrochlear glands were small but palpable. The other systems were normal.

The red blood cells were 1,420,000, white blood cells 6,000 and the hæmoglobin 40% (Sahli). The peripheral smear was normal except for hypochromic microcytic red blood cells and the sternal marrow revealed marked hyperplasia of the red blood precursors. In a wet smear, the red blood cells were of normal biconcavity. The reticulocytes were 8%, and the platelets 10% of the red blood cells. The fragility of the red blood cells was increased, hæmolysis began at 0.50% solution of sodium chloride and was complete at 0.25% (in the control, hæmolysis began at 0.44% and was complete at 0.34%). The icterus index was 13 units, van den Bergh direct was 0.9 mgm. % (normal 0.9 – 0.2), indirect 5.5 mgm. % (normal 0 – 0.8), the bromsulphthalein test, prothrombin time, the total protein and albumin-globulin ratio were normal. The serology was negative. The urinalysis was negative and the urine contained a normal quantity of urobilinogen. There was no bile in the urine. The gastric analysis showed normal free acid. The basal metabolic rate was + 4½. The chest x-ray and gastro-intestinal series were normal. A biopsy of an axillary lymph-gland revealed only chronic inflammatory change.

The slide technique was used for blood grouping. Before reading the group, the prepared slide was incubated at 37° C. Using this method, the blood group was found to be group II A. Group II A donor's blood was compatible with the patient's blood when the slide was incubated at 37° C.

The test for cold iso-agglutinins was carried out according to the method described by Finland *et al.** The patient's plasma and serum both demonstrated a positive four plus reaction.

The patient received two blood transfusions and ferrous sulphate. The jaundice and weakness disappeared and he was discharged May 29, as a case of hæmolytic anæmia with associated cold auto-agglutinins. He was readmitted for a re-check July 5. He did not have any symptoms or signs referable to weakness or jaundice. The laboratory data as compared with his previous admission were as follows:

| | May 4, 1948 | July 5, 1948 |
|---|---|---|
| Red blood cells | 1,420,000 | 3,230,000 |
| White blood cells | 6,000 | 6,250 |
| Hb. % (Sahli) | 40% | 62% |
| Fragility | Increased | Increased |
| Reticulocyte (red blood cells) | 8% | 1% |
| Platelets (red blood cells) | 10% | 7% |
| Icterus index (units) | 13 | 10 |

The cold iso-agglutinin test was still strongly positive but the auto-hæmagglutination phenomena had disappeared, that is, the blood samples, blood counts and groupings were handled at room temperature without clumping of the cells but the cold iso-agglutination test was still strongly positive by the Finland technique. The patient was discharged to carry on with his normal activities, to continue taking ferrous sulphate orally and he was advised to avoid the cold as much as possible.

*Discussion.*—The onset of the patient's weakness was associated with an attack of influenza. The symptomatology of this illness suggests that the patient probably had primary atypical pneumonia. As stated previously, during the course of primary atypical pneumonia remarkable amounts of cold agglutinins appear in the blood. This relationship is of considerable clinical significance since the cold agglutinin phenomenon is not found in secondary bacterial bronchopneumonia, pneumococcus lobar pneumonia, tuberculosis or coccidiomycosis. Since the etiological agent of primary atypical pneumonia has not as yet been identified, we have no reliable immunological test for a definite diagnosis. At present, the diagnosis must be made on the basis of the clinical picture, sputum examination and x-ray findings. In the absence of an immunological test, the cold agglutination test offers an objective means of confirming the diagnosis of primary atypical pneumonia. This test is of particular value in the protracted cases of atypical pneumonia that necessitate a long and cautious survey of the clinical and bacteriological findings before arriving at a final diagnosis. For practical purposes in detecting cold agglutinins the gross examination of the blood will often provide valuable information. If a sufficiently high titre of agglutinins is present, the agglutination can be detected along the barrel of the syringe if the blood is cooled under running tap water. Also a hanging drop or cover slip preparation of the whole blood will show the clumping macroscopically and microscopically.

The hæmolytic anæmia is of interest and its mechanism is a matter of speculation. Studies of erythrocytes *in vitro* have shown that the agglutination of erythrocytes renders them more susceptible to hæmolysis when subjected to mechanical stimuli. It follows that the agglutination of the erythrocytes in the circulation would increase the rate of red blood cell hæmolysis. Regarding this phenomenon Finland *et al.* state:

"In patients with atypical pneumonia, particularly during the height of the disease and in severe cases, there may be transient reduction in the skin temperature, especially of the extremities. This may occur during chills or as a result of exposure or of the ad-

* The erythrocytes are obtained from group IV O donors. Oxalated group IV O blood is washed three times in a large volume of saline and a 2% suspension of group IV O red blood cells in physiological saline is then made and used in the tests. The test for cold agglutinins is carried out as follows: The serum and plasma is diluted in saline 1:5 Equal volumes of the 2% cells are added, the tubes are shaken thoroughly and stored in a refrigerator overnight. The tubes are placed in an ice-water bath before the reading is made. In reading the tests, the tubes are rapidly inverted three times to loosen all of the cells from the bottom of the tube and to allow thorough mixing. The agglutination is graded from 4+ to 1+, the former representing a single hard clump of cells not broken up on mixing while the latter indicated a finely floccular agglutination, easily visible without magnification.

After the readings are made in the cold, the racks of tubes are placed in a water bath or incubator at 37° C. for two hours. All the positive agglutinations will completely reverse by this procedure.

ministration of antipyretics. In patients with marked cold auto-agglutination, there is usually a wide thermal range and significant agglutination may still occur at the temperatures which are attained in the skin of the extremities under such conditions. This might conceivably represent the conditions under which hæmolysis might occur.''[8]

Dameshek and Schwartz have described cold hæmagglutination in acquired hæmolytic anæmia. They believe that the cold hæmagglutinins are the result rather than the cause of the anæmia and splenectomy has been performed on cases of hæmolytic anæmia with cold hæmagglutinins with a favourable result. Platt and Ward point out that spontaneous cessation of hæmolysis and disappearance of the cold hæmagglutinins may occur and therefore supportive treatment should first be given adequate trial. The clinical course of this case suggests that the cold hæmagglutination was associated with the occurrence of primary atypical pneumonia and the cold hæmagglutination was causally related to the hæmolytic anæmia. The patient's clinical improvement, the increasing red blood cell count and hæmoglobin and the decreasing reticulocyte count and icterus index suggest that the hæmolysis will disappear spontaneously.

The cold hæmagglutinins are a potential source of error in blood grouping and cross-matching. Any blood containing a sufficiently high titre of cold hæmagglutinins will be interpreted as a group I AB unless the slide is incubated at 37° C. As in this case, although the patient was group II A, when the grouping was carried out at room temperature, the patient's red blood cells clumped with both group A and group B serum. This clumping was due to the cold hæmagglutination independent of the better known iso-agglutination between the various blood groups and subgroups. From the above, it is evident that additional precautions are necessary in grouping and crossmatching donors and recipients. Also all group I AB blood that cross-matches unsatisfactorily should be re-grouped at 37° C. to rule out cold hæmagglutination.

SUMMARY

1. A case of cold hæmagglutinins associated with atypical pneumonia and hæmolytic anæmia has been presented.

2. The cold hæmagglutination reaction may serve as a diagnostic aid in primary atypical pneumonia.

3. Cold hæmagglutination should be considered when a patient's blood agglutinates too readily in the syringe or clumping of the cells is noted in the counting pipette or on the counting chamber. The laboratory test according to the method of Finland *et al.* is described.

4. The cold hæmagglutination phenomena necessitates additional precautions in blood grouping and cross-matching.

I am indebted to Dr. Lea Steeves for his suggestions and advice and to Mrs. D. Lewis for the laboratory work.

BIBLIOGRAPHY

1. FINLAND, M., PETERSON, O. L., ALLAN, H. E. AND SAMPER, B. A.: *J. Clin. Invest.*, **24**: 451, 1945.
2. FINLAND, M., PETERSON, O. L., ALLEN, H. E., SAMPER, B. A. AND BURNES, M. W.: *J. Clin. Invest.*, **24**: 458, 1945.
3. FINLAND, M., PETERSON, O. L. AND BURNES, M. W.: *J. Clin. Invest.*, **24**: 474, 1945.
4. PLATT, W. R. AND WARD, C. S. JR.: *Am. J. Clin. Pathol.*, **15**: 202, 1945.
5. TURNER, J. C., JACKSON, E. B., NISNEWITZ, S. AND BERNEY, R.: *The Lancet*, **244**: 765, 1943.
6. DAMESHEK, W.: *J. Am. M. Ass.*, **123**: 77, 1943.
7. MCCOMBS, R. P. AND MCELROY, J. S.: *Arch. Int. Med.*, **59**: 107, 1937.
8. FINLAND, M. *et al.*: *J. Clin. Invest.*, **24**: 471.

## RIGHT-SIDED DIAPHRAGMATIC HERNIA*

**G. A. P. Hurley, F.R.C.S.[C.], F.A.C.S.**

*Montreal, Que.*

Of the non-traumatic forms of diaphragmatic hernia right-sided protrusion is the rarest. In a series of 430 cases of diaphragmatic hernia treated by operation, recently reported by Harrington, 1.8% were of this type. Herniation of abdominal viscera through the right diaphragm occurs usually through the foramen of Morgagni between the right costal and sternal origins of the diaphragm. The colon and omentum are most commonly involved.

The symptoms are: (1) Pain, colicky in type resulting from varying degrees of obstruction of the gut. (2) Cough and dyspnœa associated with atelectasis of the right lower lung due to pressure of the misplaced viscera. The physical signs are those of non-functioning lung anteriorly in the right cardio-phrenic angle.

The radiological signs are most important because of their puzzling nature. An abnormal area of opacity seen in the chest x-ray anteriorly in the right cardiophrenic angle must always suggest a hernia of this kind until proved otherwise. On first glance, one is reminded of a disease process, neoplastic or inflammatory,

* From St. Mary's Hospital, Montreal.

causing non-aeration of the middle lobe of the right lung. If a gas-filled knuckle of bowel presents, the possibility of hydatid cyst or abscess of the lung is suggested. Barium examination of the gastro-intestinal tract establishes the diagnosis of hernia if the protrusion involves the gut, but if only omentum is involved even this will not solve the problem. In any case this is an example of the important diagnostic principle that barium examination of the gastro-intestinal tract should never be omitted in any case of abnormal shadows in the lower lung fields immediately above the diaphragm (Lanthier).

If the x-ray is inconclusive bronchoscopy should be done to rule out obstruction of the middle lobe bronchus by neoplasm.

The treatment of right-sided diaphragmatic hernia is surgical. The method of approach is important. If the presence of bowel in the area of opacity cannot be determined by x-ray, while the sputum is negative for tubercle bacilli, an intrathoracic non-tuberculous lesion must be presumed. In this case exploratory thoracotomy through the left fourth or fifth interspace is indicated. Should the diagnosis of diaphragmatic hernia be established however, the abdominal approach through a right-sided paramedian incision is best. Such a hernia is more easily and safely reduced by traction from the abdominal side than by pulsion from the thoracic side. This, the rarest type of diaphragmatic hernia in common with paraœsophageal, the commonest type, according to Harrington is always enclosed by a peritoneal sac, and hence extensive adhesions to the intrathoracic organs, an important reason for choosing the thoracic approach, are not present. The frequent association of malrotation or malfixation of the colon with this type of hernia also points to the abdominal approach as the one of choice.

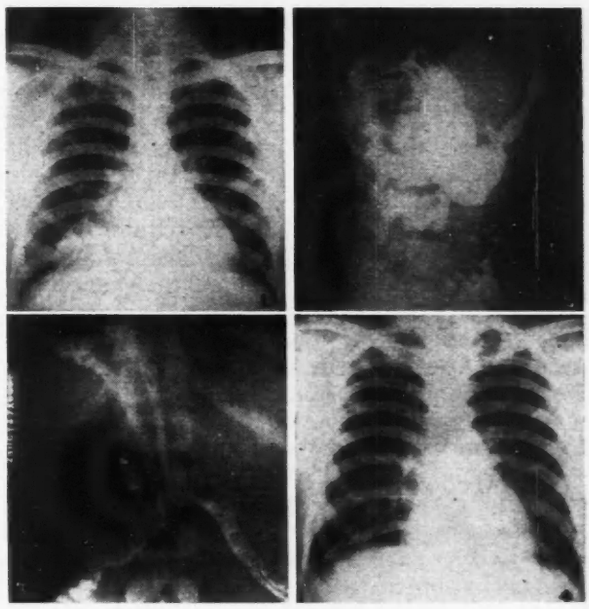
Repair of the defect is usually not difficult because of its small size. Provision should however be made for the taking of fascial suture from the thigh should this become necessary.

G.M., a 17-year old labourer was admitted to St. Mary's Hospital on October 16, 1947, complaining of pain in the right upper abdominal region and in the right costovertebral region of one month's duration. Twice during this period, for two days on each occasion, he had suffered from severe colicky pain in the right upper quadrant. He also complained of cough with a moderate amount of muco-purulent sputum.

Physical examination apart from dullness to percussion and absent breath sounds over the right cardiophrenic angle anteriorly, showed no abnormality.

Chest x-ray showed an abnormal opacity occupying the area of the middle lobe of the right lung (Fig. 1). Examination of the sputum revealed no tubercle bacilli or tumour cells. The blood picture, serology and urinalysis were not abnormal. Barium examination showed no abnormality of the stomach or small bowel, but a long loop of transverse colon was seen to extend upwards into the right lower chest. A diagnosis of right subcostosternal hernia was made (Figs. 2 and 3).

At operation, exploratory laparotomy through a right paramedian incision revealed a loop of transverse colon to pass upwards in double-barrelled fashion to the left of the falciform ligament, between the right costal and sternal origins of the diaphragm, into the right chest. The loop which measured approximately sixteen inches in length was slowly delivered into the abdomen by firm traction. It was surprising to observe the amount of traction that was required to overcome the pull of the negative pressure within the chest. There was no bleeding caused by the withdrawal, and apparently no adhesions of the herniated viscus to the intrathoracic structures. Almost all of the great omentum was also present within the sac. The colon, after delivery, was seen to be normally fixed and rotated. The appendix was diseased and was removed. The hernial sac was dissected cleanly out of the chest. The hernial opening which was oval in shape, measured approximately two inches in length and one-half inch in width.



The opening was closed with a double row of heavy braided silk sutures passing through the seventh and eighth costal cartilages bringing the sternal origin of the diaphragm to meet the costal origin; 500 c.c. of air were aspirated from the right chest via a catheter, through the opening, before the last stitch was tied.

Apart from a short episode of dyspnœa, tachycardia, and high temperature, accompanied by x-ray signs of atelectasis of the left lower lobe, which cleared spontaneously, the postoperative course was uneventful.

X-ray examination at three-monthly intervals since the operation has shown no recurrence of the hernia (Fig. 4).

Grateful acknowledgment is made to Drs. J. C. Wickham, P. R. Dunn, and J. C. Lanthier for their help in the conduct of this case.

5458 Lavoie Street.

# CLINICAL and LABORATORY NOTES

## HETEROLOGOUS BIO-CYTOCULTURE FOR TUMOUR IDENTIFICATION*

### (Preliminary report)

**William LeGrande Cooper, M.D.**

*Los Angeles, Calif.*

This paper is the first of a small series of articles on this subject, which we hope will ultimately lead to the fully completed manual on Cytoculture. This procedure utilizes the living aqueous and vitreous humours of guinea-pig eyes as the tumour culture media. It is intended to bridge a gap in the identification and radiological treatment-response of malignant tumours, the latter on a basis of inhibition of the culture-growth when subjected to standardized x-ray exposure. This work was commenced following the monumental paper on cytodiagnosis by Papanicolaou. Ordinarily the clinical picture of external cancer does not present a problem in diagnosis; however, the sensitivity to radiation not infrequently may be perplexing. Similarly, the classical presentation of epithelioma of the cervix, especially if advanced to any degree, offers no problem to the cytopathologist as far as diagnosis is concerned. The problem is made complex if the cervix lesion is very small, not easily visualized, masked by chronic erosion and ulceration, or if hidden in various portions of the deeper cervix canal or fundus of the uterus. Otherwise in a majority of such cases the exfoliative cell smear technique has often proved a method for early diagnosis of cancer, by a rather simple expediency.

The drawback to the cytologic test is that even the most experienced observer will fail to recognize all the variable forms of malignant cell changes. In most cases positive reports must be considered presumptive until verified by regular tissue biopsy. The question now arises, what of the malignant processes which defy identification by visual inspection, or those lesions which are hidden in the deeper portions of the cervix canal. The employment of the heterologous bio-cytoculture appears to be the answer to this problem.

Exfoliative cells which have been shed loosely into some recess of a body cavity, and which may be acceptable for diagnostic identification by the smear method, will not serve for the culture method. In our experience, we have learned that the cells must be freshly scraped from the lesion, which represents the cancer *in situ*. This accounts for our failure to propagate the malignant tissue by culture, when their sources were pleural, peritoneal, bronchus or stomach. One exception was a positive identification of carcinoma of the kidney, utilizing the cellular urinary sediment. We have encountered a small number of positive smears, including a number of suspiciously positive smears, which upon cytoculture proved to be negative. The theoretical possibility presents itself that perhaps we are overlooking the broader sense of cellular death when it reverts back to a more differentiated or embryonal status, after having fulfilled its purpose as part of living tissue. While the exfoliated or dead cells may account for the false positive smear findings, the criteria for malignancy, which takes on a distinctive entity in the living cell, can be substantiated by cytoculture.

#### TECHNIQUE OF TEST AND PRELIMINARY PREPARATIONS

The material for heterologous bio-cytoculture is collected only by scraping the areas which make up the suspicious lesion, using the "surface biopsy" method. The material is placed into graduated conical centrifuge tubes containing 3 c.c. of sterile Ringer's solution. These tubes are stored in the refrigerator until ready for use. Two tubes are used for each patient. Upon addition of the cervical scrapings, a dense, opaque solution is soon obtained. Experience tells us that the amount of material collected should yield an opacity consistent with that of one part homogenized milk to nine parts of water. The tubes are then subjected to 30 seconds of germicidal ultra-violet radiation, to kill any bacteria which may be present. Both suspensions are then centrifuged at 20,000 revolutions per minute for three minutes and the supernatant fluids pipetted off to the 0.7 c.c. level. By snapping the fingernail against the side of the tube while holding it in the other hand, there will again be produced a heavier uniform emulsion-like solution of the scraped material. The contents of both tubes are pooled. This preparation may be stored in the ice-box for three to four days, without destroying its tumour-propagating properties. In the interim, if desired, bacterial sterility tests can be made to insure non-interference from undestroyed organisms. It requires five guinea pigs for each test, which will offer ten orbital sites for receiving the test material inoculum. The size of the animal is of no consequence, as long as they are adult, neither is any particular preparation or after care to be considered. We seemed to have had a higher incidence of positive growth-cultures in the female of the species than in the male; however, this may be a chance percentage, since no attempts have been made to accurately check the positive results on a basis of the animal sex relationships. One c.c. of material

* This study was aided by grants from The Lindberg Foundation, Inc., Los Angeles.

is drawn into a sterile allergy-type syringe, using a 20 gauge needle, ½ inch in length. This syringe is sturdier than the tuberculin type, and is graduated more accurately; capillary leakage between the inner part of the barrel and the plunger is minimized. One drop of 5% cocaine is dropped into the everted lower lid of each eye in the five animals, and each animal is anæsthetized with ether, using a small conical graduate holding a cotton sponge containing the anæsthetic. The animal should be wrapped in a towel to prevent scratching the operator. Immediately after the stage of induction, the head of the animal should face the operator so that the line of vision is directly into the animal's eye, the raised body of the animal being held somewhat obliquely. The needle is thrust through the cornea, in the centre of the eye, then sharply to one side, just past the periphery of the lens, and at this point, 0.05 c.c. of material is injected into the vitreous body, in the lateral area just behind the iris. The needle is then withdrawn slowly until the point is seen in the anterior chamber and then the needle is angulated downward very sharply, and again 0.05 c.c. is released into the lower portion of the anterior chamber, into the aqueous humour. Hence 0.1 c.c. is used for each eye, 0.2 c.c. for each animal, and 1.0 c.c. for the entire five animals.

The instillation of the cocaine will prevent any post-anæsthetic rubbing of the eye due to discomfort, which is insurance against extraneous infection. The animals are placed in their cages without any further attention, after being labelled for identification. The eyes are observed after six days, and if a positive growth has developed within this period, small tubercular lesions are seen in the anterior chamber, with fogging of the media. Our experience has been that once these lesions are developed, the intraorbital lesions behind the iris are also in progress, but at a more rapid rate of growth. Animals which do not develop the initial anterior chamber lesions by the end of the 21st day, can be considered negative for malignancy. In positive cases usually six of the ten eyes will be involved, in an average of four animals.

### EVALUATION OF THE TESTS

The whole eye may be sectioned, or if the tumours are large, portions of the masses may be taken out and examined separately by the routine histological technique. The most valuable information gained is the distinctive patterns of the cancer-type which is reproduced and most easily identified. There is no doubt that small plaques of malignant cells find their way into the test animals, as seen by the reproduction of whole acinar structures of the adenocarcinoma. These structures, which form distinctive patterns of the mother-cell tumour inoculum, offer a large degree of diagnostic relief, in contrast, to the interpretive complications which arise by merely seeing the cells on examination of the direct smear preparation. It appears that the non-malignant cells of the inoculum are either phagocytized, or absorbed following disintegration.

Once the animals and materials are set up and the procedure is standardized, it offers a relatively simple method for tumour identification, which may otherwise resolve itself into a problem if dependent upon the interpretation of the direct smear reading. The negative animals should not be used again, and it would not be advisable to use a positive test animal's serum for routine complement fixation tests. We have found that the eye tumours develop highly specific antigenic properties which are serologically specific for the type of tumour. Such animals will yield a high degree of anti-complementary readings if their complements are used for routine purposes. A second report is in preparation in which we have investigated the possibility of exploiting the tumour antibody production for classification of tumours on a serological basis.

We have used quite a number of heterologous cytoinoculations to clear up the ultimate status of the so-called precancerous or border-line types of neoplasms. The technique is slightly modified so that the inoculum is made by merely scraping the lesion or tumour with a blunt-edged instrument. Incidentally, similar emulsions can be made from any large tumour masses which histologically show undifferentiated cell types of anaplasia. If done under sterile precaution, treatment of the suspension with germicidal ultra-violet radiation, can be dispensed with. It brings to mind one case in particular, about two years ago, in which the consensus of a group of pathologists diagnosed an undifferentiated cell tumour in the abdominal wall, as that of a mesenthelioma. After examining the heterologous transplant, the tumour was confirmed as being an adenocarcinoma. A follow-up of the case some eighteen months later showed the primary lesion to be in the stomach, which produced no gastrointestinal symptoms at the time the original metastasized tumour was discovered in the abdominal wall. The more one studies the tendencies of malignant tumours the more one must conclude that no two different types of tumour act or progress in the same way, and that similar tumours do not act alike in different people.

Our experience with connective tissue neoplasms, being very limited, is inconclusive. However, out of twelve histologically identified sarcomas, only one successful cytotransplant has been accomplished. Tests with the lymphomas, lymphogranulomas, myelogenous and

lymphatic leucæmias, have all consistently failed to reproduce by this method.

### RADIOLOGICAL CONSIDERATION OF HETEROLOGOUS TUMOUR CULTURE

The use of five guinea pigs would potentially supply ten transplants, to further offer a medium of measuring the tumour growth response to radiation. One animal in which the cytological transplant has "taken", or at least one "positive" eye should be permitted to remain untreated within the living animal, to be used as a control. We have noted on not too infrequent occasions, that retrograde changes can take place in a positive culture resulting in a spontaneous regression, and affecting a self-limiting process. Therefore, in order to determine whether or not a transplant is radiosensitive or radioresistant, the post-radiation effects in the treated animals should be compared with those of the control eye. Our attempts to enucleate a cancerous eye and continue its growth in artificial tissue culture media have also been unsuccessful. For this reason, the eye-growths should be subjected to radiation testing only while it is still in the living animal. It should be mentioned that the degree of radio-sensitivity or radio-resistence in the tumours of the treated animal, will not always be a decisive indication that a similar rate of curability will take place in the subject from whom the primary tumour material had been taken. For whatever the reason, regardless of the favourable response to radiation in the animals, we would, in a number of cases, find the patient coming to autopsy after apparently appropriate intensive radiation therapy.

### DISCUSSION

In reviewing our statistical data which total an overall of 812 cases, we have had 314 positive and 498 negative heterologous bio-cytocultures. Of the 314 positive cases, 260 cases were positive by the cytological smear technique of Papanicoloau, 43 were doubtful or suspicious, while 11 were negative. Of the 498 cases which were negative by the heterologous bio-cytoculture, 77 were cases subsequently proved to be of a cancerous disposition. This 15% discrepancy in the negative series could only mean that the scraped inoculum test material did not contain sufficient parenchymal cells representative of the mother-tumour mass. Further, of the 77 false negative cases (or missed positive cases), 48 subsequently showed positive findings by the direct smear technique, during the later stages, while the remaining 29 missed cases, definitely proved cancerous by histological technique, at no time gave indication of representing a malignant growth either by the cytological smear method or by the cytoculture technique. This may be a point of noteworthy significance; judging from our series, then, about 6% of the malignancies will have to be diagnosed by the conventional method of biopsy and histopathological examination.

### CONCLUSIONS

1. A simple method of identifying malignant tumours by heterologous bio-cytoculture is presented.

2. The method of handling scrapings of the suspicious lesion is given; use of guinea-pig eyes as living culture media, forms the basis of this test.

3. Distinct tumour patterns evolve from positive cytocultures, in contrast to the indistinctive single cell structures of direct smear cytodiagnosis.

4. The radiosensitivity of the malignant tumours may be ascertained in the test animals.

---

WHAT THE RED CROSS DID.—In September, 1939, the staff of the International Committee of the Red Cross consisted of 50 workers; by April, 1945, there were almost 4,000. By the end of October, 1946, the Geneva agency had 39 million names on their index, had forwarded 13 million letters and postcards for prisoners-of-war, and had transmitted and censored 24 million civilian letters. The hard work, intelligence, and sympathy which lie behind these figures emerge from the pages of the report* which the committee have now published. An example of the care needed to get details correct is that there were 15,000 people named Martin on the agency's files, and 1,400 Jean Martins. Handling the food parcels was another complex job. On the Marseilles to Geneva line alone, the international committee moved goods equal in bulk to all Switzerland's food imports from overseas, and courage must have been needed to cross the Atlantic covered only by the Red Cross, while others were in strongly protected convoys. But in the end 36 million parcels were transported.

In its attempts to help civilians in occupied countries the Red Cross was hampered by lack of power. The Tokio draft convention had not been ratified, and the belligerents refused to undertake to implement it. The international committee did succeed in obtaining the concession that interned civilians should rank as prisoners-of-war, but only after a long struggle were they permitted to do anything for the deportees in the concentration camps. In 1943, when permission was given for the dispatch of parcels to individuals, only 100 names were on the files at Geneva. But parcels went, receipts came back with other names, the snowball grew, till by the end 750,000 parcels were sent. Other people whom the Red Cross could do all too little to help were the Russian prisoners—th U.S.S.R. had not ratified the 1929 convention—and the European prisoners in Japanese hands. A proposal to set up protected zones for wounded, sick, and children made in March, 1944, when air-raids were reaching their worst, was turned down by both sides.

By the end of the war the international committee had spent 45 million Swiss francs, of which more than half had been contributed by Switzerland.—*The Lancet*, April 24, 1948.

---

* Inter Arma Caritas. Geneva, 1947.

**THE CANADIAN MEDICAL ASSOCIATION**

**Editorial Offices—3640 University Street, Montreal**

*(Information regarding contributions and advertising will be found on the second page following the reading material.)*

# EDITORIAL

## NATIONAL HEALTH SERVICE ACT IN AUSTRALIA

AN Act to establish a National Health Service was passed by the Government of Australia in December, 1948, although at the time of writing, it has not yet been proclaimed. Its scope is of the widest, embracing all aspects of health, and it is applicable to the entire population. As to its desirability we have nothing to say. It follows the pattern laid down in New Zealand and Great Britain. But the events which led up to it are worthy of our attention. They are similar in some respects, but not all, to those associated with the development of the National Health Service in Great Britain. There was the setting forth of the policy of the medical profession, with the laying down of such basic principles as the development of preventive as well as curative medicine; free choice of doctor; provision for consultant and special services; co-ordination of all medical services; and several other details. Then came the conferences between the Government and the representatives of the profession in Australia. Out of these grew the stated objection of the profession to certain aspects of the legislation proposed by the Government, notably plans leading to doctors becoming whole time salaried servants of the State, and to the apparent intention of eventually abolishing private practice altogether; as well as other points of detail of administration.

The profession had made it quite clear that they wished to create for the people of Australia a medical service of the highest quality and available to all. But they took strong objection to the associated principles in the Government policy. By 1948, however, the Government had made up its mind to proceed with the Bill, closing its negotiations with the Federal Council of the British Medical Association in Australia with accusations of seeking the interests of its members rather than those of the people generally. The Bill then was passed, and is now faced with a degree of opposition by the profession which can be well appreciated. What is chiefly to be noted is the precipitancy with which the government has forced through this health measure.

The profession in Australia feel that their aims must be clearly placed before the people, and an Independence Fund is being raised not only to set forth the views of the profession but to give assistance to any member of the Association who is directly affected in his practice through government action.

We can only watch the outcome of these developments with the keenest interest and sympathy.

# EDITORIAL COMMENTS

### Insecticides on Vegetables

There have been warnings in popular newspaper medical notes regarding the possible danger of poisoning from vegetables which have been treated with arsenical pesticides. Some of these warnings include advice to wash the vegetables with various chemical solutions, and housewives may well ask, as some have done, whether there is really any need for such drastic precautions as have been outlined. The Department of Agriculture of Ottawa has been kind enough to give us some authoritative information on the point. The Department points out that in generlal the danger is negligible where growers follow the directions laid down by the Dominion and Provincial departments of agriculture. Arsenicals are not used on such ordinary salad crops as lettuce, leeks, cress, celery and parsley; on herbs; on greens such as Swiss chard and spinach. Ordinarily they are not applied to artichoke, green beans, beets, carrots, Chinese cabbage, corn, onion, parsnip, peas, pepper, pumpkins, radish, rhubarb and turnip.

Where it is necessary to use protective sprays as with cabbage, cauliflower, Brussels sprouts and broccoli, this is done before the heads form, and in any case arsenicals are being replaced by DDT.

Apart from the fact that arsenicals are being used less and less, the protective sprays are always used at too early a stage of growth to leave any appreciable residue on the edible part of the plant.

---

### Drinking of Sea Water

The drinking of sea water to allay thirst has always been regarded as dangerous, and all evidence confirms the statement. Sea water causes a progressive intracellular dehydration, even though assisting in the removal of nitro-

genous waste products. Furthermore the kidneys cannot excrete a sodium chloride in a solution of a little less than 2%, whilst sea water contains about 3%.

These objections all apply to undiluted sea water. Until recently there has been little done to examine the effects of sea water diluted with fresh water, although various instances of survivors amongst castaways are quoted in which the addition of small amounts of sea water to the daily ration of fresh water served to make the water supplies last longer without apparent harm. A Russian naval officer, for example, survived 36 days in an open boat in the Black Sea drinking sea water along with the small daily ration of fresh water; sometimes obtaining a little from rain as well. His companions all died; but he had become so accustomed to the sea water that two years later he found fresh water and ordinary food to taste unsalted.

Another argument in favour of the addition of sea water is that men on short water rations lose excessive amounts of chloride and some sodium in the urine and sweat, and this loss is replaced by sea water.

Whillans and Smith[1] have carried out experiments on this point, basing their conclusions on the relative gain or loss in weight of human beings whose drinking water had a daily supplement of sea water. Preliminary study had shown that equal volumes of sea water and fresh water were not tolerated for more than one day and, consequently, a proportion of 10 ounces of sea water to 16 ounces of fresh was used.

Two groups of four men each were tested, one receiving 16 ounces of fresh water per day, plus food rations, and the other 16 ounces of fresh water and 10 ounces of sea water, plus food rations.

The results showed a mean weight-saving of 2.24 lb. over a period of 6 days, and the men receiving the addition of sea water agreed that the extra supplement resulted in less loss of stamina and helped in the chewing and swallowing of their food. All thought that if they were cast away in a boat at sea and had only a small supply of fresh water, they would add sea water to it. It is pointed out that other factors may have to be considered in this adding of sea water, such as sea-sickness, exposure to weather, mental stress, or a combination of these. But the experiments give some ground for further investigation of what may turn out to be of considerable practical value.

1. WHILLANS, M. G. AND SMITH, G. F. M.: The ingestion of sea water as a means of attenuating fresh water rations, *Can. J. Res.*, **26**: 4, 250.

# MEN and BOOKS

## PÆDIATRICS AND MEDICAL PRACTICE*

### The H. B. Cushing Memorial Lecture

**Alton Goldbloom, M.D., F.R.C.P.[C.]**

*Professor of Pædiatrics, McGill University, and Physician-in-Chief, Children's Memorial Hospital, Montreal, Que.*

No honour could have been conferred upon me which I could have appreciated more keenly than that of being the first to give the Memorial Lecture in honour of Harold Beveridge Cushing. If I have been chosen as one suited for such recognition, it is because of my long association with Dr. Cushing, when I was deeply conscious of how much could be learnt about many things by association with him; not only about medicine, where his knowledge was profound, but about the whole world of nature and natural phenomena, each day bringing fresh surprises and new admiration.

Since I am speaking primarily to undergraduates who were denied the unique experience of his teachings, perhaps, before I speak of the scope of pædiatrics, I might devote a few minutes to a brief appreciation of the man whose memory we are honouring tonight. He was born in 1873, on April 6, and attended the public schools of Montreal and the Montreal High School. He obtained his B.A. degree in 1892. In order to obtain money for his further education, he taught school for one year and spent another on a geological survey in the Hudson's Bay region. He graduated from Medicine in 1898, and as a medical student demonstrated in the Department of Botany and did a little tutoring. It was during his tutoring years that he met and made friends with the late Dr. McKenzie Forbes the orthopædic surgeon; it was this friendship that virtually determined his career as a pædiatrician, for with the founding of the Children's Memorial Hospital by McKenzie Forbes, Dr. Cushing was invited to become the physician to that institution. As he said in later years, pædiatrics sought him out; and it was this friendship with Forbes and Forbes' great admiration of his extraordinary gifts that led to his selection as the first physician to this new hospital.

It was Cushing's amazing versatility that made him a great pædiatrician, for he would have been equally great in whatever branch of medicine he might have chosen. Four physicians were appointed to the newly erected Alexandra Hospital for contagious diseases. The first world war left Cushing alone as the

* The first H. B. Cushing Memorial Lecture. Delivered at McGill University, October 28, 1948. This Lecture was established by the Nu Sigma Nu Fraternity, Montreal.

sole attending physician, and as a result of this association he rapidly became a leading authority on communicable diseases. He had the Midas touch in medicine—not that he ever ranked among the great earners, but he could turn into gold the dross of the seemingly banal and uninteresting case. Cushing's diagnosis was always touched with flashes of genius. He had a divine gift of picking out from a welter of confusing and conflicting data the one inconspicuous fact that would solve the seemingly insoluble, which had confused both the biochemical and the pathological laboratories and discomposed the radiologist. Instances abound and are rapidly becoming legendary, but an example or two will suffice to illustrate the fine balance of his judgment and his rare gift for picking out from the sister and ancillary sciences that atom of particular knowledge which applied to the case in question. A pathologist once showed him a cross section from an appendix that had been removed for acute inflammation. There was something in it that puzzled all who beheld it, but Cushing quietly suggested that it was a cross section of a grain of wheat that had lodged in the appendix. This was quickly confirmed at the Department of Botany. He had once taught botany, and he had not forgotten.

Again, he once was called to see a sick child in consultation. The place was a small store that sold soft drinks and candies in the front room while the family lived in the rear of the store. His reasoning was quick and sure. He suspected and proved chronic lead poisoning because he had observed a tank of $CO^2$ for aerating water for soft drinks connected to a faucet by means of a thin, flexible lead pipe. He reasoned that a child living on the premises might prefer the aerated water, and thus become exposed to more lead than would the occasional consumer.

The year that sulfanilamide first became available, he saw in consultation a young girl with multiple discharging sinuses from suppurative adenitis of the neck and axilla. Despite a strongly positive tuberculin reaction he suggested that this was not tuberculosis as everyone else had claimed, but that such complications were occasionally seen after scarlet fever and therefore suggested a trial with the new drug. Again, to the general amazement, these months-old suppurations rapidly healed. This ability to see beyond a positive tuberculin reaction, to recognize the unusual in an environmental situation, to identify the unusual in a pathological section, characterized the genius of Harold Cushing.

His interests were general; they included botany, entomology, geology, ornithology, furniture, clocks, history, sports. At the time of his death he was president of the St. Andrew's Historical Society, whose museum he and the late Dr. Maude Abbott helped to found.

Cushing lived through, grew up with, benefited by and contributed to, an era of pædiatrics during which it emerged from an inexact groping specialty of feeding infants with esoteric formulæ, to a specialty embracing the entire field of medicine related to a period of life. Cushing, above all his contemporaries, as well as those who were privileged to call themselves his pupils, was always aware of the scope of pædiatrics in which nutrition played a small however important part. He always saw pædiatrics as the whole of medicine applied to the child and his environment. For this reason I have chosen to discuss, in this first Memorial Lecture, the scope of pædiatrics in relation to medical practice, and teaching in relation to research, and in relation to the social sciences, particularly psychiatry.

## PÆDIATRICS AND MEDICAL PRACTICE

Not many years ago, the whole of pædiatric teaching in even the best medical schools consisted of about one demonstration per week in the final year, and a few lectures, rarely more than ten or twelve. Many medical schools had no pædiatric instruction beyond perhaps a few demonstrations on new-born infants given by an obstetrician, who at the same time demonstrated the method in vogue in his particular institution of preparing formulæ for infants during the first week of life. This was the beginning and thé end of pædiatric teaching. Pædiatric instruction was available on a postgraduate basis in many parts of the world, but the undergraduate received little or no benefit from this.

In one of the last papers written by the late Dr. L. Emmett Holt, and published posthumously, he indicated—and this was 1924—that pædiatrics must look forward to three phases in its development; the training of practitioners who shall go out into various parts of the country and look after the health of the growing portion of the population; the training of teachers who shall devote their time to instructing the undergraduate and the graduate in pædiatrics; the training of scientists who shall contribute to and enhance our knowledge of the phenomena of health and growth and disease in children and to make such advances available to the practitioner and teacher.

Pædiatrics, like all medicine, has indeed developed along exactly such lines; but the ideal in teaching the undergraduate has not yet been attained in many American and Canadian schools of medicine. I have repeatedly emphasized that since about one-third of the population falls within the purview of the pædiatrician, certainly sufficient pædiatric instruction should be given in our medical schools to acquaint each student with at least some of the fundamental differences between children and adults and to instruct him in some of the more important pædiatric disciplines. Unless we

pause to think of our country as a whole, we are apt to forget that only a really small portion of our child population is being cared for by qualified pædiatricians. There are rural areas, small towns and villages, and indeed fair-sized cities, that have no pædiatricians and whose children—nearly one-third of the population—are being looked after by physicians who are only too keenly aware of their woeful inadequacy in this regard. Pædiatrics in the medical curriculum is no longer a minor subject at McGill University. It is a major subject in the final year, and gives approximately 300 hours of instruction in this specialty. The student leaving McGill has at least learned some of the essentials of medicine as applied to children, and so has had his feet placed on the right road. Pædiatric instruction must be given not so much with a view of training specialists, but with the view of guiding all physicians, whatever their interests or specialties, along pædiatric lines, orienting the physician and the surgeon to the child, all with the full appreciation that the pædiatricians are a small portion of the medical population and that taking the country as a whole, the great majority of infants and children are being fed and cared for and treated by men and women in general practice. We must see to it, therefore, that their undergraduate instruction is adequate in this regard.

When we consider the scope of pædiatrics in medical research, we are faced with a limitless field, many-sided and variable as medicine itself. Whatever the scope of medical research in its particular needs, yet there are many aspects of medical research which have a peculiar pædiatric application, and which therefore, should and usually do originate in the pædiatric research laboratory. Medicine, in general, benefits from these advances which in turn are modified and adapted to the needs of the adult. The need for keeping a fine balance between observed phenomena and their clinical applications ever exists and must never be overlooked, but the need for constant observation, experiment, search and application ever exists. In the field of pure pædiatrics many gaps in our understanding need to be filled. A few only might be mentioned in order to indicate the scope and trend of pædiatric research. In the field of the antibiotics and of chemotherapy the search for new and more widely useful agents is progressing for the benefit of all medicine, and pædiatrics can hardly claim any special consideration in this regard; but in the field of virus research, pædiatrics should claim some priority and could assume some leadership. Poliomyelitis is still a disease which affects mainly young children. No significant advances in the treatment of the acute attack or in prophylaxis have as yet been made, although some progress has been made in the study of its epidemiology and of the nature of the numerous strains of the virus. No real advances, however, will be made until the problem is attacked from the general standpoint of virus disease, rather than from the specific point of view of poliomyelitis itself. The world must await what might be called the discovery, of the law of viruses or that weak spot in their metabolism which might be attacked by interfering with their essential metabolic processes. When this principle is discovered, a great advance will have been made in the battle against all diseases caused by viruses and of course poliomyelitis will be one of these.

In the past decade considerable progress has been made in the study of the physiology of the premature and mature newborn infant. The observations of Levine and Gordon with reference to the metabolism of phenylalanine and tyrosine in premature infants, and the effect of ascorbic acid on this metabolism, has led to considerable speculation about the rôle of vitamins in the metabolism of the newborn infant —ascorbic acid, the vitamin B complex and others, not only in relation to specific full blown avitaminoses, but as substances essential to carbohydrate and protein metabolism whose lack in the diet manifest immediate and discernible results. Here is a field of pædiatric research which can benefit the entire field of nutrition.

In water and electrolyte metabolism, much has been clarified by Gamble and many others who have come under his influence, yet much still remains to be learned of extra- and intracellular fluid balance and of therapy by means of sodium, potassium, chlorine, and other ions in the control of cellular metabolism during acute illness in infants where water loss and mineral imbalance can wreak havoc far beyond the ravages of the causative disease and indeed mask all other symptoms. Again we have the rôle of vitamins, endocrines and doubtless enzymes to consider in relation to these disturbances. The scope of research in this field is limitless.

And now cardiac physiology has taken on a new and increased importance. The development of methods for the surgical treatment of some congenital cardiac manifestations has given a new fillip to this important aspect of pædiatric physiology. Here too there is a fruitful, rewarding field of pædiatric research which will continue to gain in importance as newer methods of treatment develop, and as exact diagnosis becomes more and more important.

The biochemistry of mental defects, though it has made little headway, still presents a challenging problem to pædiatric research. The elucidation of the mechanism of phenyl pyruvic ketosis, the understanding of the relationship between galactose diabetes and mental deficiency, and a complete understanding of the place of glutamic acid in the metabolism of cerebral tissues, are only the bare fringes of a subject

that may well help us in time to understand the causes and mechanisms of mental deficiencies in children. At present, we have only a few vague hints; the opportunities for research in this branch of pædiatric knowledge are also both considerable and important.

When we come to consider the child in relation to his environment, we must take some cognizance of all the social sciences in relation to the child. Psychiatry and child guidance are but two aspects of a vast problem, however important these two may be. Senn has pointed out that the child must be considered as part of a constellation acting on and reacting to all the forces within his orbit; that he cannot, in this respect, be considered as an individual independent and free acting. He is victim and aggressor; he acts and reacts; he sets social forces in motion and is at the same time subject to the social forces about him. It can readily be seen that the study of all the social sciences must give adequate place to the consideration of the child in the nation's economy. One part of this study is child psychiatry, psychology, and guidance, in which may be included parent education. Here, again, we are only at the outer boundaries of a vast domain.

Pædiatrics must take cognizance of its responsibility for training physicians to take their proper places in health departments of Federal, Provincial and urban organizations and to become authorities and leaders in problems related to the evaluation of the child from every standpoint. Many of these methods of evaluation are still crude and under the control of ill-trained, ill-paid, personnel. Here is a new field for the expert, a fact which is just beginning to be realized in some States and which promises to grow to the importance which it rightly deserves.

In the training of teachers to teach, sufficient attention is not yet given to the problem of teaching teachers to know children. Intensive training in this connection would soon develop men and women in the teaching profession who would greatly enhance the value of the child as a future citizen. Some teachers have this quality as a providential endowment, but in all too few has it been taught as—so to speak—a craft. One sees this daily in the attitude assumed by many teachers towards the child whose learning ability is limited. The complaint of mischievousness or inattention is frequently levelled against such children by individuals who by training, should be the first to grasp the fact of the limitations of such a child. Many a child is brought to a clinic after he has been made to feel unwelcome and insecure in the presence of his school fellows, only to exhibit a chronic illness, a partial deafness, a limited learning capacity at the base of his difficulty. Education is more than learning, and teaching is more than instruction. The parents as part of this family constellation require no less understanding than the child. We speak so often of child psychiatry, when what we really mean is the sum total of interacting forces within the family group and their effect on its component parts. Without being psychiatrists, we become aware in practice of a whole host of such interacting forces—rivalries, hostilities, guilt feelings, insecurity—all usually very thinly disguised and readily unveiled, which are the true *fons et origo* of the complaints for which a child is brought to the pædiatrician. "What is troubling you?" addressed to the mother, will often evoke a shower of tears and a woeful tale of tensions within the home, which make the child's reactions readily understandable and at times easily corrected. The night terrors, the anorexia or the gluttony, the wetting and the soiling, the aggressiveness, or the timidity, can often be shown to have their roots elsewhere. Does it not mean then, that somewhere in pædiatric study there is a place for studying and understanding the members of the family group other than the child? Does it not mean that our system of education should include instruction in marriage, parenthood, and the family relationship, available on the largest possible scale to the largest number of people? Is not this, or part of this, within the scope of pædiatrics?

Adult medicine attempts to mend the errors of the past. Pædiatrics should attempt to prevent the errors of the future; if this is its aim, its scope is limitless.

Of all the social sciences, pædiatrics should become the greatest, with the widest interests and applications. It is, indeed, the twig-bending branch of medicine. Much can be said of the neglect of superior children in our conventional and stylized educational system. Much more time, effort and money is being spent on the limited individual while the superior child chafes under the restraints of his conventionalized school system. Much can be said of the place of pædiatrics in relation to the second great period of rapid change in the life of the child, namely adolescence—that great unknown no man's land of medicine; much can be said for the place of genetics in the purview of pædiatrics; but enough, I think, has been said to emphasize the dynamic fluidity of this all important branch of the medical science.

---

The term "interne", whilst of French origin, was apparently first used in the United States. The earliest example of its use, as recorded by the Oxford English Dictionary (Supp. 1933) occurs in the following sentence in the *Kansas City T. and Star*, October 16, 1889: "Convalescent women and young nurses are given too much freedom with the 'internes' ".

**PRELIMINARY PROGRAM**
**EIGHTIETH ANNUAL MEETING**
**OF THE**

# Canadian Medical Association

**TO BE HELD IN THE BESSBOROUGH HOTEL, SASKATOON**
**JUNE 13, 14, 15, 16, 17, 1949**

*President*—Dr. William Magner, Toronto.
*President-Elect*—Dr. J. F. C. Anderson, Saskatoon.
*General Secretary*—Dr. T. C. Routley, Toronto.
*Assistant Secretary*—Dr. A. D. Kelly, Toronto.
*Honorary Local Secretary*—Dr. G. Gordon Ferguson, Saskatoon.

Arrangements for the Eightieth Annual Meeting to be held in Saskatoon during the week of June 13 are proceeding satisfactorily. General Council will meet on Monday and Tuesday, June 13 and 14. On Tuesday evening, the members of General Council and their wives will be dinner guests of the Saskatchewan College of Physicians and Surgeons. A series of Round Table Conferences has been arranged for the mornings of Wednesday, Thursday and Friday from nine until ten-thirty o'clock, to be followed by General Sessions. Sectional meetings will be held on Wednesday, Thursday and Friday afternoons. The Annual General Meeting will be held on Wednesday evening, June 15, commencing at 8.30 p.m. On this occasion, the retiring President, Dr. William Magner, will hand over the badge of office to his successor, Dr. J. F. C. Anderson.

## SCIENTIFIC PROGRAM

### Wednesday, June 15

## ROUND TABLE CONFERENCES

9.00 - 10.30 a.m.

### Anæsthesia

*Anæsthesia for Intestinal Obstruction.*

Dr. B. C. Leech, Regina (Chairman); Dr. L. B. Jaques, Saskatoon; Dr. S. Young, Regina; Dr. D. M. Ewart, Moose Jaw; Dr. R. S. Daymond, Saskatoon.

### Medicine

*Congenital Heart Disease (Medicine, Pædiatrics and Radiology).*

Dr. Arnold L. Johnson, Montreal (Chairman); Dr. John D. Keith, Toronto; Dr. Arthur Childe, Winnipeg; Dr. R. K. Thomson, Edmonton; Dr. Maurice Young, Vancouver.

### Obstetrics and Gynæcology

*The Management of Occiput Posterior Position.*

Dr. A. W. Andison, Winnipeg (Chairman); Dr. T. Rondeau Jarrott, Paris, Ont.; Dr. Ruvin Lyons, Winnipeg; Dr. A. H. Maclennan, Edmonton; Dr. A. E. Trites, Vancouver.

### Ophthalmology

*Glaucoma.*

Dr. Norman L. Elvin, Winnipeg (Chairman); Dr. J. D. Anderson, Regina; Dr. C. E. Davies, Vancouver; Dr. R. O. McDiarmid, Brandon.

### Pædiatrics

*Congenital Heart Disease (Pædiatrics, Medicine and Radiology).*

Dr. Arnold L. Johnson, Montreal (Chairman); Dr. John D. Keith, Toronto; Dr. Arthur Childe, Winnipeg; Dr. R. K. Thomson, Edmonton; Dr. Maurice Young, Vancouver.

### Preventive Medicine

*Community Services — (Joint conference, Preventive Medicine and Psychiatry).*

Dr. D. G. McKerracher, Regina (Chairman); Dr. T. A. Pincock, Winnipeg; Dr. B. H. McNeel, London; Dr. Z. Selinger, Weyburn; Dr. C. M. Hincks, Toronto; Dr. R. O. Jones, Halifax; Dr. A. M. Doyle, Toronto.

### Psychiatry

*Community Services (Psychiatry and Preventive Medicine).*

Dr. D. G. McKerracher, Regina (Chairman); Dr. T. A. Pincock, Winnipeg; Dr. B. H. McNeel, London; Dr. Z. Selinger, Weyburn; Dr. C. M. Hincks, Toronto; Dr. R. O. Jones, Halifax; Dr. A. M. Doyle, Toronto.

### Radiology

*Congenital Heart Disease (Radiology, Medicine and Pædiatrics).*

Dr. Arnold L. Johnson, Montreal (Chairman); Dr. John D. Keith, Toronto; Dr. Arthur Childe, Winnipeg; Dr. R. K. Thomson, Edmonton; Dr. Maurice Young, Vancouver.

### Surgery

*Surgical Diseases of the Newborn.*

Dr. W. S. Anderson, Edmonton (Chairman); Dr. M. B. Perrin, Winnipeg; Dr. C. Allard, Edmonton; Dr. J. Holowach, Edmonton.

### Urology

*Urological Problems of Interest to the General Practitioner.*

Dr. W. A. Dakin, Regina (Chairman); Dr. J. C. McClelland, Toronto; Dr. Robin Pearse, Toronto; Dr. E. P. White, Kingston; Dr. W. P. Hogarth, Fort William; Dr. Gerald Parkins, Moose Jaw.

## GENERAL SESSION

### Wednesday, June 15

10.45 a.m.

*Valedictory Address.*

Dr. William Magner, Toronto, President, Canadian Medical Association.

*The Blackader Lecture: Parents and Pædiatrics.*

Dr. James Spence, Newcastle-on-Tyne, England.

*The Training of a General Practitioner.*

Dr. Wingate Johnson, Winston Salem, N.C.

# SECTIONAL MEETINGS

## Wednesday, June 15

### Anæsthesia

2.15 p.m.

*Anæsthesia for Chest Surgery.*
Dr. W. M. Hall, Vancouver.

*Pædiatric Anæsthesia for Cardiac Surgery.*
Dr. M. K. Belton, Vancouver; Dr. H. Kester, Vancouver; Dr. Digby Leigh, Vancouver.

*Anæsthesia for Intra-thoracic Surgery in Children.*
Dr. Virginia Apgar, New York.

### Historical Medicine

*Medical Archives and their Relation to the Profession.*
Dr. G. D. Stanley, Calgary.

*Extra-Mural Medical Education in the Province of Ontario.*
Dr. G. Stewart Cameron, Peterborough.

*Henry Bence Jones.*
Dr. Harold N. Segall, Montreal.

*Samuel Pepys and His Table.*
Dr. D. E. H. Cleveland, Vancouver.

*From Greek Philosophy to Modern Medicine.*
Dr. Heber Jamieson, Edmonton.

### Industrial Medicine

*The Older Worker—His Preparation for Retirement.*
Professor A. N. Reid, Saskatoon.

*The Executive's View of Health Services in Industry.*
Mr. J. A. Chambers, Vice-president, George Weston Limited, Toronto.

*The Pneumokonioses. Developments—Doubts and Difficulties.*
Dr. E. R. A. Merewether, London, Eng.

*The Prevention and Care of Coronary Disease in the Executive.*
Dr. F. A. L. Mathewson, Winnipeg.

*Psychosomatic Disturbances and their Bearing on the Worker's Efficiency.*
Dr. H. Graham Ross, Montreal.

### Medicine

*Coma in the Diabetic.*
Dr. Walter deM. Scriver, Montreal.

*The Psychic Factor in Asthma.*
Dr. H. K. Detweiler, Toronto.

*The Diagnosis of Liver Disease.*
Dr. J. A. Dauphinee, Toronto.

*The Medical Treatment of Liver Disease.*
Dr. J. C. Sinclair, Toronto.

### Obstetrics and Gynæcology

**Round Table Conference—**
*Hypertension in Relation to Pregnancy:*
*(a) Hypertensive Disease not peculiar to Pregnancy;*
*(b) Hypertensive Disease peculiar to Pregnancy, i.e., Pre-eclampsia and Eclampsia.*
Dr. A. C. H. Wensley, Saskatoon (Chairman); Dr. M. G. Israels, Regina; Dr. R. B. Mitchell, Winnipeg; Dr. A. B. Nash, Victoria.

### Ophthalmology

*The Treatment of Muscle Imbalance in Children.*
Dr. A. L. Morgan, Toronto.

*Differential Diagnosis of Important Lesions of the Optic Disc.*
Dr. A. J. Elliot, Toronto.

*Modern Methods of Treatment of Malignant Tumours of the Eye.*
Dr. C. E. Davies, Vancouver.

*Pseudoretinoblastoma (coloured slides).*
Dr. E. N. Wright, Port Arthur.

### Pædiatrics

**Round Table Conference**—(Pædiatrics and Psychiatry).
*Behaviour Problems Arising in Infancy and Childhood.*
Dr. W. A. Hawke, Toronto (Chairman); Dr. J. Lloyd Brown, Regina; Dr. C. H. Gundry, Vancouver; Dr. Gordon Stephens, Winnipeg; Dr. J. C. Miller, Mastai.

### Preventive Medicine

*The Rôle of the General Practitioner in the Prevention of Tuberculosis.*
Dr. John Orr, Fort San.

*Immunization in Practice.*
Dr. G. M. Little, Edmonton.

*Preventive Medicine and Health Insurance.*
Dr. Fred Mott, Regina.

*The Rôle of the Practising Physician in the Prevention of Cancer Mortality.*
Dr. A. J. S. Bryant, Regina.

### Psychiatry

**Round Table Conference**—(Psychiatry and Pædiatrics).
*Behaviour Problems Arising in Infancy and Childhood.*
Dr. W. A. Hawke, Toronto (Chairman); Dr. J. Lloyd Brown, Regina; Dr. C. H. Gundry, Vancouver; Dr. Gordon Stephens, Winnipeg; Dr. J. C. Miller, Mastai.

### Radiology

*Artificial Radioactivity.*
Professor J. W. T. Spinks, Saskatoon.

*Some Observations on Myelography with Special Reference to Minor but Important Deformities.*
Dr. A. E. Childe, Winnipeg; Dr. G. Frank Boult, Winnipeg; Dr. Mathew K. Kiernan, Winnipeg.

*Estimation of the Age of Fractures of Vertebral Bodies.*
Dr. F. H. Bonnell, Victoria.

*Oral Cancer in the Female.*
Dr. Germain Pinsonneault, Montreal
Dr. Guillaume Gill, Montreal.

### Surgery

*Cholecystitis and Cholelithiasis.*
Dr. A. J. Grace, London.

*Pancreatitis.*
Dr. Norman H. Gosse, Halifax.

*Suction Socket Limbs for Above Knee Amputations.*
Dr. R. I. Harris, Toronto
Dr. R. C. Rider, Toronto.

*Inguinal Pain Following Herniorrhaphy.*
Dr. C. E. Corrigan, Winnipeg.

### Urology

*Pathogenesis and Treatment of Frequent Micturition in Women.*
Dr. David Mitchell, Toronto.

*Interstitial Cystitis.*
Dr. Robin Pearse, Toronto.

*Total Cystectomy in the Treatment of Vesical Carcinoma.*
Dr. Deward O. Ferris, Rochester, Minn.

# ROUND TABLE CONFERENCES

## Thursday, June 16

9.00 - 10.30 a.m.

### Anæsthesia

*Anæsthesia for the Aged.*
Dr. W. S. Johns, Calgary (Chairman); Dr. R. A. Gordon, Toronto; Dr. Robert Daymond, Saskatoon; Dr. Nelson Nix, Edmonton; Dr. E. H. Watts, Edmonton; Dr. Clair Rumball, Regina; Dr. M. K. Belton, Vancouver.

### Dermatology

*Recent Advances in Dermatological Therapy.*
Dr. Charles Hair, Toronto (Chairman).

### General Practitioners

*Partnership and Group Practice.*
Dr. Morley A. R. Young, Lamont (Chairman); Dr. G. L. Gass, Sackville; Dr. M. R. Stalker, Ormstown; Dr. J. Z. Gillies, Toronto; Dr. T. A. Lebbetter, Winnipeg; Dr. L. G. Bray, Moose Jaw; Dr. R. B. Brummitt, Nelson.

### Medicine

*Western Equine Encephalomyelitis (Medicine, Pædiatrics and Preventive Medicine).*
Dr. D. F. Moore, Saskatoon (Chairman); Dr. J. S. Fulton, Saskatoon; Dr. D. E. Rodger, Regina; Dr. U. J. Gareau, Regina, Dr. J. G. Rempel, Saskatoon.

### Obstetrics and Gynæcology

*The Problem of Infertility and Sterility (Obstetrics, Gynæcology and Urology).*
Dr. K. T. MacFarlane, Montreal (Chairman); Dr. S. A. MacDonald, Montreal; Dr. C. J. Pattee, Montreal; Dr. A. C. Gardner Frost, Vancouver; Dr. Travis Dancey, Montreal.

### Otolaryngology

*The Chronic Nose: Obstruction and "Catarrah".*
Dr. C. H. Andrews, Prince Albert (Chairman); Dr. Robert Black, Winnipeg; Dr. E. L. Moyer, Moose Jaw; Dr. J. C. K. Langford, Saskatoon; Dr. T. J. Haughton, Regina; Dr. E. J. Washington, Winnipeg.

### Pædiatrics

*Western Equine Encephalomyelitis (Pædiatrics, Medicine and Preventive Medicine).*
Dr. D. F. Moore, Saskatoon (Chairman); Dr. J. S. Fulton, Saskatoon; Dr. D. E. Rodger, Regina; Dr. U. J. Gareau, Regina; Dr. J. G. Rempel, Saskatoon.

### Preventive Medicine

*Western Equine Encephalomyelitis (Preventive Medicine, Medicine and Pædiatrics).*
Dr. D. F. Moore, Saskatoon (Chairman); Dr. J. S. Fulton, Saskatoon; Dr. D. E. Rodger, Regina; Dr. U. J. Gareau, Regina; Dr. J. G. Rempel, Saskatoon.

### Radiology

*The Betatron.*
Dr. E. W. Spencer, Saskatoon (Chairman); Harold E. Johns, Ph.D., Saskatoon; Professor E. L. Harrington, Saskatoon.

### Surgery

*Management of Malignant Disease of the Colon and Rectum.*
Dr. D. C. McRae, Regina (Chairman); Dr. L. H. Appleby, Vancouver; Dr. D. G. McQueen, Calgary; Dr. M. R. MacCharles, Winnipeg; Dr. C. C. Ross, London.

### Urology

*The Problem of Infertility and Sterility (Urology, Obstetrics and Gynæcology).*
Dr. K. T. MacFarlane, Montreal (Chairman); Dr. Lee Smith, Vancouver; Dr. S. A. MacDonald, Montreal; Dr. C. J. Pattee, Montreal; Dr. A. C. Gardner Frost, Vancouver; Dr. Travis Dancey, Montreal.

## GENERAL SESSION

### Thursday, June 16

10.45 a.m.

*Carcinoma of the Uterus.*
Dr. Deward O. Ferris, Rochester, Minn.

*The Relationship between Government Medical Services and the Canadian Medical Profession.*
Dr. W. P. Warner, Ottawa.

*Carcinoma of the Breast.*
Dr. R. M. Janes, Toronto.

## SECTIONAL MEETINGS

### Thursday, June 16

2.15 p.m.

### Anæsthesia

*Continuous Spinal Anæsthesia in Abdominal Surgery.*
Dr. W. Easson Brown, Toronto.

*Cardiac Irregularities under Anæsthesia.*
Dr. Code Smith, Toronto.

Annual Meeting of The Canadian Anæsthetists Society.

### Dermatology

*Skin Diseases Common to Farmers and Other Outdoor Workers.*
Dr. A. G. Duncan, Calgary.

*Acne Vulgaris.*
Dr. J. F. Burgess, Montreal.

*The Treatment of the Inflamed Skin.*
Dr. L. P. Ereaux, Montreal.

*The Psychogenic Approach in the Treatment of Skin Diseases.*
Dr. D. E. H. Cleveland, Vancouver.

### General Practitioners

*Surgery in General Practice.*
Dr. C. J. Houston, Yorkton.

*What the General Practitioner Desires in a Scientific Program.*
Dr. H. G. Hall, Toronto.

*Pancreatitis.*
Dr. Wingate Johnson, Winston Salem, N.C.

### Medicine

*Antibiotics in the Treatment of Tuberculosis.*
Dr. H. D. Jenner, Prince Albert.

*The Present Status of the Medical Treatment of Hyperthyroidism.*
Dr. D. M. Baltzan, Saskatoon.

*Critical Evaluation of the Use of Gold Salts in the Treatment of Rheumatoid Arthritis in Private Practice.*
Dr. P. H. Sprague, Edmonton
Dr. M. K. Young, Edmonton.

*Arthritis: Its Treatment in the Home.*
Dr. Frank S. Brien, London.

*The Principal Patterns of Cardiac Pain Related to Arteriosclerotic Coronary Artery Disease.*
Dr. H. N. Segall, Montreal.

### Obstetrics and Gynæcology

*Ectopic Pregnancy: A Problem in Diagnosis.*
Dr. E. H. McFadyen, Saskatoon.

*The Management of Endometriosis and its Complications.*
Dr. P. J. Kearns, Montreal.

### Otolaryngology

*The Management of Common Facial Injuries.*
Dr. H. M. Graham, Regina.

*Atelectasis.*
Dr. W. Ross Wright, Fredericton.

*Bronchoscopy as an Aid to Diagnosis and Treatment of the Lungs and Tracheobronchial Tree.*
Dr. S. Laird Alexander, Toronto.

*Hearing Defects in Children—diagnosis and treatment.*
Dr. Lavell H. Leeson, Vancouver.

### Pædiatrics

*Well Water Methæmoglobinæmia in Infants.*
Dr. Harry Medovy, Winnipeg.

*Clinical Aspects of the Rh Factor.*
Dr. Maurice Berger, Winnipeg.

*Infantile Diarrhœa.*
Dr. H. W. Price, Calgary.

*The Adequate Care of the Premature Infant.*
Dr. Peter Spohn, Vancouver.

### Psychiatry

*Epilepsy—Diagnosis and Medical Treatment.*
Dr. C. H. Pratt, Woodstock.
*Psychoneurosis—A Non-Pensionable Disabling Condition.*
Dr. T. E. Dancey, Verdun.
*The Treatment of Psychosomatic Illness in a General Hospital.*
Dr. Arthur M. Doyle, Toronto.
*Work Done in Psycho-Surgery in Saskatchewan.*
Dr. Lorne H. McConnell, Saskatoon.

### Radiology

*Cancer of the Lip—Its Radiotherapeutic Management and Results.*
Dr. C. C. Burkell, Saskatoon.
*Cancer of the Cervix Uteri.*
Dr. Ivan Smith, London.
*Tricho Bezoar—A Review of Literature and Presentation of an Unusual Case.*
Dr. A. R. McGee, Toronto
Dr. Ross Lobb, Toronto.

### Surgery

**Round Table Conference—**
*Surgical Emergencies in the Upper Abdomen.*
Dr. C. W. Burns, Winnipeg (Chairman); Dr. P. H. T. Thorlakson, Winnipeg; Dr. A. C. Abbott, Winnipeg; Dr. F. A. B. Sheppard, Winnipeg.
**Round Table Conference—**
*Surgical Emergencies in the Lower Abdomen.*
Dr. F. H. Wigmore, Moose Jaw (Chairman); Dr. Walter C. MacKenzie, Edmonton; Dr. Hugh Norman, Toronto; Dr. Angus D. McLachlin, London.

### Urology

*Acute Lower Urinary Tract Infections.*
Dr. H. S. Good, Regina.
*Carcinoma of the Prostate.*
Dr. Perry White, Kingston.
*The Treatment of Prostatic Obstruction—A Statistical Review of 1,000 Cases.*
Dr. C. B. Stewart, Winnipeg.
*The Use of Streptomycin in Renal Tuberculosis.*
Dr. J. C. McClelland, Toronto.
Dr. Kenneth F. Davis, Toronto.

## ROUND TABLE CONFERENCES

### Friday, June 17

9.00 - 10.30 a.m.

### Anæsthesia

*Spinal Anæsthesia Versus Inhalation Anæsthesia Combined with Curare and Pentothal Intravenously.*
Dr. W. E. Upthegrove, Saskatoon (Chairman).

### Armed Forces Medical Section

*Newer Problems in Aviation Medicine.*
W./C. Brock Brown, R.C.A.F., Toronto.
*The Examination of Recruits.*
Surgeon Captain A. McCallum, Ottawa.
*The Medical Record—World War II.*
Dr. William Feasby, Toronto.

### Dermatology

*Pyogenic Infections of the Skin.*
Dr. B. Brachman, Regina (Chairman); Dr. Arthur Birt, Winnipeg; Dr. George Sexton, London; Dr. D. F. Moore, Saskatoon.

### Medicine

*The Positive Approach to Chronic Disease.*
Dr. A. T. Jousse, Toronto (Chairman); Dr. A. J. Longmore, Regina; Dr. A. E. Buckwold, Saskatoon; Dr. G. F. Strong, Vancouver; Dr. J. D. Adamson, Winnipeg; Dr. F. A. L. Mathewson, Winnipeg; Dr. Henry P. Wright, Montreal.

### Obstetrics and Gynæcology

*Non-Specific Pelvic Infections.*
Dr. Robert B. Meiklejohn, Toronto (Chairman); Dr. J. Lorne Macarthur, Montreal; Dr. Leonard Cowan, Regina; Dr. H. F. P. Grafton, Kamloops.

### Pædiatrics

*The Breast Milk Survey.*
Dr. W. S. Kinnear, Saskatoon (Chairman); Dr. J. H. Ebbs, Toronto; Dr. Peter Spohn, Vancouver; Dr. A. F. Hardyment, Vancouver; Dr. E. Couture, Ottawa.

### Psychiatry

*The Handling of Psychosomatic Problems.*
Dr. F. S. Murray, Saskatoon (Chairman); Dr. D. E. Rodger, Regina; Dr. Gordon H. Hutton, Vancouver; Dr. Gilbert Adamson, Winnipeg; Dr. F. S. Lawson, North Battleford.

### Radiology

*Cancer of the Stomach.*
Dr. A. J. S. Bryant, Regina (Chairman); Dr. A. E. Perry, Regina; Dr. Frank Schroeder, Regina; Dr. Clayton Crosby, Regina; Dr. Irwin Bean, Regina.

### Surgery

*Non-Thyroid Tumours of the Neck.*
Dr. Roy Huggard, Vancouver (Chairman); Dr. Gordon Johnston, Vancouver; Dr. Gordon S. Fahrni, Winnipeg.

## GENERAL SESSION

### Friday, June 17

10.45 a.m.
*Children's Health Centres and Their Uses.*
Dr. Donald Paterson, Vancouver.
*The Proper Place of Nerve Block Therapy.*
Dr. Virginia Apgar, New York.
*Delayed Lesions Following "Shock".*
Dr. J. C. Meakins, Montreal.

## SECTIONAL MEETINGS

### Friday, June 17

### Armed Forces Medical Section

2.15 p.m.
*Chemical Warfare.*
H. M. Barrett, Suffield, Alberta.
*Medical Problems of Paratroops.*
Major B. L. P. Brosseau, R.C.A.M.C., Rivers, Man.

### Medicine

*Cysts of the Lungs—Medical, Surgical Aspect.*
Dr. J. B. Jobin, Quebec.
*Friedlander Bacillus Meningitis.*
Dr. C. W. Holland, Halifax.

### Obstetrics and Gynæcology

**Round Table Conference—**
*Gynæcological Bleeding.*
Dr. A. C. Gardner Frost, Vancouver (Chairman); Dr. L. B. Jaques, Saskatoon; Dr. Anna Wilson, Winnipeg; Dr. J. L. McArthur, Montreal.

### Surgery

*Observations in the Management of Peptic Ulcer.*
Dr. Donald A. Thompson, Bathurst.
*The More Common Applications of Reconstructive Procedures in Hand Surgery.*
Dr. F. M. Woolhouse, Montreal.

# THE EXHIBITORS

*THE LIST of exhibitors for the 80th Annual Meeting is published herewith. Every important aspect of pharmaceuticals and all the varied elements that are required in the practice of medicine and surgery are represented, and we ask that our members make a special point of visiting these interesting exhibits.* — (EDITOR).

*Springtime* [*Photo by the late Dr. F. T. Tees*]

Ames Co. of Canada Ltd.
Armour Laboratories
Ayerst, McKenna & Harrison Ltd.

Borden Co. Ltd.
Bristol Laboratories of Canada Ltd.

Canada Packers Ltd.
Canadian Kodak Co. Ltd.
Canadian Canners Ltd.
Canadian Liquid Air Co. Ltd.
Canadian Tampax Corp. Ltd.
Carnation Co. Ltd.
Coca-Cola Ltd.
Cow & Gate (Canada) Ltd.

Denver Chemical Mfg. Co.
De Vilbiss Mfg. Co. Ltd.
Dohow Chemical Corp.
Dominion Oxygen Co. Ltd.
Down Bros. and Mayer & Phelps Ltd.

Eldorado Mining & Refining Ltd.
Eli Lilly & Co. (Canada) Ltd.

Ferranti Electric
Fisher & Burpe Ltd.
Frosst & Co., Chas. E.

General Electric X-ray Corp.

Heinz Co. of Canada Ltd., H. J.

Imperial Optical Co.
Ingram & Bell Ltd.

Lederle Laboratories

Macmillan Co. of Canada Ltd.
McNair Products Co. Ltd.
Mead Johnson & Co of Canada Ltd.
Merck & Co. Ltd.
Mowatt & Moore Ltd.

Ortho Pharmaceutical Corp. (Canada) Ltd.

Parke Davis & Co. Ltd.
Picker X-Ray of Canada Ltd.
Poulenc Frères of Canada Ltd.

Reckitt & Colman (Canada) Ltd.
Ryerson Press

Sharp & Dohme (Canada) Ltd.
Shuttleworth Chemical Co. Ltd., E. B.
Squibb & Sons of Canada Ltd., E. R.
Swift Canadian Co. Ltd.

Vi-Tone Products Ltd.

Warner & Co. Ltd., Wm. R.
Wyeth & Bro. (Canada) Ltd., John

X-Ray & Radium Industries Ltd.

Zenith Radio Corp. of Canada Ltd.

# NOTICE

In accordance with Chapter XII, Section 2 of the By-Laws of the Association, the Committee on Constitution and By-Laws recommends the following amendments to the By-Laws for ratification at the eightieth annual meeting:

Amend Chapter V of the By-Laws by striking out the whole of the said Chapter and substituting the following:

CHAPTER V—SECTIONS

*Section 1.—Organization and Functions*

Members of The Canadian Medical Association, with the consent and approval of the General Council, may organize a Section for the purpose of: (*a*) interesting The Canadian Medical Association in a particular field of medicine; (*b*) voicing considered expressions of opinion for the benefit of The Canadian Medical Association on matters which concern the Section; and (*c*) arranging for meetings in co-operation with the Central Program Committee.

*Section 2.—Recognition of Existing Sections*

The following Sections are recognized as existing on the 13th day of June, 1949:

Anæsthesia
Armed Forces Medical Section
Dermatology
General Practice
Historical Medicine
Industrial Medicine
Medicine
Obstetrics and Gynæcology
Ophthalmology
Otolaryngology
Pædiatrics
Preventive Medicine
Psychiatry
Radiology
Surgery
Urology

*Section 3.—New Sections*

New Sections may be organized on the application in writing of not less than twenty-five members of The Canadian Medical Association, setting forth the subject or subjects proposed for study and discussion by the Section and the proposed name of the Section. Such application shall be filed with the General Secretary of the Canadian Medical Association, and submitted by him to the next meeting of the Executive Committee after the application is received, and the Executive Committee shall transmit the application to the next meeting of the General Council with its recommendations in respect of the application, and the General Council may grant the application in the form made or with such variations therein as the applicants may approve, or may refuse the application or postpone consideration thereof.

*Section 4.—Meetings*

Subject to the approval of the Executive Committee, a meeting of each Section will be held during the Annual Meeting of The Canadian Medical Association. Other meetings of a Section may be called by the Chairman of the Section with the approval of the Executive Committee. Notice of a meeting of a Section other than a meeting to be held during the Annual Meeting, shall be given by publication in an issue of the *Journal* of The Canadian Medical Association published not less than one month prior to the meeting.

*Section 5.—Right to Attend and Vote at Meetings*

(*a*) Members of The Canadian Medical Association attending the Annual Meeting may register in any one Section, but such registration shall have force only until the next Annual Meeting.

(*b*) Any member of The Canadian Medical Association may attend any meeting of any Section.

(*c*) No member of The Canadian Medical Association may vote at any session of a Section unless he is registered in it as aforesaid, prior to the commencement of such session.

*Section 6.—Officers*

There shall be a Chairman and Secretary of the Section elected at a meeting thereof held during an Annual Meeting of The Canadian Medical Association, and they shall hold office from the close of that meeting until the close of the next meeting of the Section held during an Annual Meeting. In the event of either of the said officers not being elected as aforesaid or resigning or dying or becoming incapacitated during his term of office, the Executive Committee may appoint a member of The Canadian Medical Association to fill the office until the next election.

*Section 7.—Duties of the Chairman*

The Chairman, or someone designated by him, shall preside at all meetings of the Section, and if he be absent and no one has been designated by him to preside, the meeting of the Section shall elect a Chairman.

*Section 8.—Duties of the Secretary*

The Secretary of the Section shall keep a correct record of its transactions in duplicate and one copy shall be handed to the General Secretary of The Canadian Medical Association for insertion in the Minute Book provided for the purpose. The other copy shall be retained by the Secretary of the Section for the use of the Section and its officers.

*Section 9.—Program at Annual Meeting*

It shall be the duty of a Section through its Chairman and Secretary to co-operate with the Central Program Committee, to arrange for the meeting of the Section to be held during the Annual Meeting.

*Section 10.—Dissolution of Sections*

In the event of it appearing from the small number of registrations in a Section or the failure to hold meetings thereof, or on any other ground, that interest in its subject or subjects is lacking, the General Council, on the recommendation of the Executive Committee, may dissolve the Section, and it shall not be revived except upon a new application for recognition.

*Section 11.—Authority of the Section*

No Section or meeting of a Section and no officer or officers of a Section shall have the right to speak for The Canadian Medical Association as such, but any resolution passed at a meeting of a Section may, if the meeting so decides, be submitted to the General Council or the Executive Committee of The Canadian Medical Association for consideration and action, and it shall be the duty of the General Council or the Executive Committee, as the case may be, to receive such resolutions and consider the same and take such action as it may decide in respect thereof at its first meeting after the receipt of such a resolution.

CHAPTER VII—DUTIES OF OFFICERS

Amend Chapter VII of the By-Laws by adding the following new Section:

*Section 7.—Duties of the Assistant Secretary (or Assistant Secretaries)*

An assistant Secretary shall perform such duties as may be assigned to him by the General Secretary.

CHAPTER IX—COMMITTEES

*Section 1.—Duties and Powers of the Executive Committee*

(*a*) Delete the third paragraph and substitute the following:

The Executive Committee shall be responsible for the appointment of the General Secretary, the Assistant Secretary or Assistant Secretaries, the Editor, the Managing Editor, and any other appointive officers, (designating their responsibilities) and shall fix their salaries.

(*b*) After the second paragraph, insert the following new paragraph:

The Chairman of the Executive Committee instead of calling a meeting thereof, *may*, and, if requested so to do in writing by any three members of the Committee, *shall* take a mail ballot of the elective members of the Executive Committee on any urgent matter, and

an affirmative vote by two-thirds of such members shall have the same force and effect as a resolution duly passed at a regular meeting of the Executive, provided such mail ballot is taken in the following manner:

The question submitted shall be in a form to which an affirmative or negative answer may be given. The ballot shall be sent by prepaid registered post to all elective members of the Executive not less than ten days before the last return date accompanied by a letter signed by the Chairman of the Executive Committee setting out the circumstances of the emergency, giving the last date on which ballots will be received, and requesting that ballots be signed and returned to the Secretary of the Association by such elective members by the date named. Simultaneously with the sending out of the ballots to the elective members of the committee, a copy of the aforesaid letter shall be mailed to those members of the Executive Committee who are not entitled to vote, together with a copy of the question which is being submitted to the elective members. No ballot will be counted unless it is signed by an elective member of the Executive and is in the hands of the Secretary of the Association not later than the return date named. Each elective member may cast one ballot only.

CHAPTER VI—OFFICERS AND EXECUTIVE COMMITTEE

*Section 2.—Duties of Nominating Committee*

Amend by deleting the whole of paragraph 3, and substituting the following:

*Paragraph 3.*—Nomination from members of General Council of nine alternates for the elected members of the Executive Committee. There shall be one alternate nominated from each Province. The function of the alternates shall be to act in the place of an elected member of the Executive Committee who is absent because of death or illness or from cause acceptable to the Chairman of the Executive Committee.

# MEDICAL SOCIETIES

## British Columbia Surgical Society

The British Columbia Surgical Society, whose President for the past year has been Dr. T. H. Lennie of Vancouver, has just completed its second Annual Meeting, which was held this year in Vancouver. The meeting was open to all members of the medical profession, and there was a large attendance. Two packed days of addresses and clinics were held, and the Guest Speaker, Dr. T. H. Clagett of the Surgical Division of the Mayo Foundation, made a notable contribution to the success of the meeting. The following were elected for the ensuing year; Dr. A. B. Nash, Victoria, President; Dr. J. R. Neilson, Vancouver, Vice-President; Dr. H. J. Wride, Victoria, Secretary-Treasurer.

Next year's meeting will be held in Victoria.

## Quebec Division—Canadian Medical Association

The annual meeting of the Quebec Division of The Canadian Medical Association was held in Montreal, at the Mount Royal Hotel, April 22 and 23, 1949, under the Presidency of Dr. Jean Saucier. There was an exceptionally good registration and the hard work of the organizing committees was reflected in the smoothness of all the arrangements. An excellent display of scientific exhibits was on view and the commercial exhibits were well placed. The alternate use of French and English in the presentation of papers and discussion was noticeable and was greatly aided by lantern slides with résumés in the second language. A special feature was introduced in the shape of a symposium on recent advances in physiology of interest to the general practitioner. This covered such subjects as protein feeding by Dr. E. H. Bensley; sodium metabolism by Dr. J. Olivier of Sherbrooke; iron metabolism by Dr. O. F. Denstedt; and vitamin $B_{12}$ by Dr. E. S. Mills.

Among the luncheon guests were Msgr. O. Maurault, Rector of the Université de Montréal, who gave a short and most attractive address on some aspects of language; Col. Wilfrid Bovey, who spoke wisely and clearly about trends in the social and economic aspects of medicine; His Worship Mayor Camillien Houde, who displayed all his well known talents for extending a genial welcome; and Dr. Victor Johnson, President of the Ontario Medical Association, who spoke with his sound and practical knowledge on the problems of general practice. The Division was also glad to welcome Dr. William Magner, President, and Dr. Arthur Kelly, Assistant Secretary, of the parent body.

The final item on the program was the feature which was so successful before—the presentation of a case for diagnosis. Under the skilful chairmanship of Dr. Paul Robert a stimulating and lively clinico-pathological conference developed, led by Dr. Pierre Marion, whose patient was the subject of discussion, and Dr. J. L. Riopelle, pathologist. Several prizes were offered for correct solution of the problem by the commercial exhibitors, and the breezy presentation of these by Dr. Gordon A. Copping brought a most successful meeting to a pleasant close.

## Society of Obstetricians and Gynæcologists

The Annual Meeting of the Society of Obstetricians and Gynæcologists of Canada will be held at Jasper Park Lodge, June 18 to 21, 1949. Dr. J. R. Vant, Edmonton, President. Dr. J. O. Baker, Edmonton, Secretary.

## La société médicale des hôpitaux universitaires de Québec

Société médicale des hôpitaux universitaires de Québec, le 5 novembre, 1948.

**Considérations sur un cas d'abcès pulmonaire.**—C.-H. Dorval.

Les antibiotiques en administration locale et parentérale améliorent le pronostic des abcès pulmonaires et évitent de nombreuses interventions. Un patient de 46 ans qui avait présenté un abcès chronique d'emblée avec association fuso-spirillaire a été guéri par un traitement local et général de 75 grammes de sulfadiazine et 15,000,000 d'unités de pénicilline. Malgré une aggravation marquée au début, les signes cliniques et radiologiques sont pratiquement disparus et l'individu n'a pas fait de rechute dans les quatre mois qui ont suivi sa guérison apparente.

**Tuberculose laryngo-bronchique et streptomycine.**—Jules Hallé et A. Pothier.

Les auteurs rapportent l'observation de quatorze tuberculoses du larynx et onze tuberculoses des bronches traitées par la streptomycine au cours des douze derniers mois. Neuf des quatorze cas de tuberculose laryngée sont actuellement considérés comme guéris et les cinq autres sont très améliorés. Sur les onze cas de tuberculose des bronches, cinq sont guéris, cinq sont améliorés et un seul malade a résisté au traitement. Dans la tuberculose du larynx, la streptomycine a une action rapide sur les symptômes fonctionnels: la dysphagie disparaît en 3 ou 4 jours, l'aphonie se corrige en quelques semaines.

Elle agit aussi bien sur les formes œdémateuses, granuleuses ou ulcéreuses récentes. Les bronches bénéficient de son action dans tous les cas de granulations circonscrites par une muqueuse œdémateuse typique. Le médicament agit avec plus de lenteur sur les ulcères

chroniques. Les lésions anciennes ulcéro-granuleuses, avec sténose de l'arbre bronchique, résistent généralement à son action.

**Méningite tuberculeuse et streptomycine chez un enfant.**—R. Desmeules, M. Giroux et Ph. Richard.

Les auteurs rapportent l'observation d'un enfant de trente mois, pesant 25 livres, atteint d'une tuberculose ganglio-pulmonaire qui s'est compliquée d'une méningite bacillaire. La streptomycine administrée par les voies intra-musculaire et intra-rachidienne à la dose globale quotidienne de 0.25, soit à la dose de 0.01 par livre de poids corporel, a permis d'obtenir une modification précoce et favorable des signes méningés cliniques, une atténuation moins rapide des signes généraux qui ont persisté durant vingt-cinq jours, une disparition lente des signes bio-chimiques au niveau des humeurs rachidiennes, la négativation du liquide retiré de l'estomac, la mutation favorable des images ganglio-pulmonaires. La thérapeutique a été poursuivie durant vingt-cinq jours. L'amélioration obtenue persiste depuis plus de sept mois.

L'épreuve de résistance au bacille de Koch prélevé dans le liquide céphalo-rachidien et ensemencé sur le milieu de Loewenstein a démontré qu'il s'agissait d'une souche sensible jusqu'à un microgramme sur milieu de Herrold.

Comme il faut le recul prolongé du temps avant de conclure à la guérison d'une méningite tuberculeuse, les auteurs se gardent de la préjuger. Ils font toutefois observer que le liquide a cessé d'être hyperlymphocytaire depuis trois mois et que l'inoculation au cobaye ne le tuberculise pas.

Société médicale des hôpitaux universitaires de Québec, vendredi le 21 janvier, 1949.

**Considérations orthopédiques concernant un cas de maladie de Recklinghausen.**—L.-P. Roy, J. Turcot et M. Guay.

A l'occasion d'un cas de maladie de Recklinghausen, chez une femme de 50 ans, présentant des fractures multiples, une revue est faite du diagnostic positif et différentiel avec les myélomes multiples le Paget, les métastases, les hyperthyroïdies. Le traitement orthopédique lui-même ne varie pas d'avec celui des fractures ordinaires. Dans le cas présent un Thomas-splint a été installé sur les deux membres inférieurs avec traction continue pendant 8 semaines. La calcification a progressé énormément de même que la consolidation.

**Deux cas de sarcoïdose ou maladie de Besnier-Boeck-Schaumann.**—J. Grandbois et J.-L. Bonenfant.

Deux cas de sarcoïdose ou de Maladie de Besnier-Boeck-Schaumann sont présentés. Les localisations multiples des lésions montrent bien qu'il s'agit d'une maladie de système. Chez la première patiente, la peau et les poumons sont le siège des lésions, tandis que dans le deuxième cas, les localisations sont pulmonaire, ganglionnaire, gastrique, oculaire, spénique et salivaire. Dans les deux cas, l'examen histopathologique révèle une infiltration épithélioïde à disposition plus ou moins folliculaire sans caséum, où il fut impossible de mettre en évidence le bacille de Koch. Le deuxième cas présentait plusieurs cellules géantes de type Langhans, contenant des corps protoplasmiques étoilés dits ''astéroïdes''.

Le bon état général des deux patientes montre l'evolution prolongée chronique de la sarcoïdose.

**Tumeur de Pancoast-Tobias.**—A.-R. Potvin, Alphonse Giguère et R. Lessard.

Les formes anatomo-cliniques du cancer du poumon sont nombreuses. La localisation apicale, qui est encore appelée tumeur de Pancoast-Tobias, est râre. Les auteurs rapportent une observation de tumeur de l'apex pulmonaire. Il y avait, chez la malade, une masse à la région dorsale supérieure gauche, au niveau du grand dorsal. On notait, en plus, un syndrome net de Claude Bernard-Horner du même côté et une fracture de l'arc postérieur de la quatrième côte. Une biopsie, faite au niveau de la région scapulaire gauche, a démontré la présence d'une tumeur maligne par places nécrotique et très riche en mitoses. Les cellules néoplasiques sont très indifférentes. La malade est décédée deux mois après le début de son hospitalisation. L'autopsie n'a pu être pratiquée.

# CANADIAN ARMED FORCES

## News of the Medical Services

Surgeon Commander H. R. Ruttan, O.B.E., R.C.N., is taking a course in Dermatology at University Hospital, Ann Arbour, Michigan.

Surgeon Commander M. C. Wellman, R.C.N., has been appointed as Assistant Medical Director General, Naval Headquarters, Ottawa.

Acting Surgeon Commander R. A. G. Lane, R.C.N., has assumed the duties of Command Medical Officer, Atlantic Coast, and Surgeon Lieut. Commander J. H. Fleming, R.C.N., has been appointed Principal Medical Officer, R.C.N. Hospital, Halifax.

The class of approximately forty students taking the various courses in public health at the School of Hygiene, University of Toronto, visited the R.C.A.M.C. School at Camp Borden April 8, 1949. The purpose of the visit was to observe the health arrangements of a military camp and was part of the field training of the graduate students. The party was under the direction of Dr. M. H. Brown, O.B.E., Director of Field Training, School of Hygiene, University of Toronto, and transportation from Toronto to Camp Borden and return was provided by the Army. Dr. Brown, in a letter of thanks to the D.G.M.S., stated that the entire group had found the visit stimulating and instructive and expressed his appreciation for the arrangements made for the group at the camp by Lieut.-Col. W. R. I. Slack, Commanding Officer of the R.C.A.M.C. School. It is hoped that this visit will become an annual event.

Colonel J. N. B. Crawford, M.B.E., E.D., senior consultant to the Director of Medical Services, Canadian Army, was a member of the Canadian delegation to the Diplomatic Conference for the Establishment of International Conventions for the Protection of War Victims, which took place in April at Geneva, Switzerland.

Major F. C. R. Chalke, R.C.A.M.C., formerly of the staff of the Kingston Military Hospital, was posted to Army Headquarters, Ottawa, March 23, 1949, as adviser in psychiatry in the Directorate of Medical Services (Army).

Brigadier W. L. Coke, O.B.E., D.G.M.S. (Army), attended the first post-war reunion of the 24th Field Ambulance, R.C.A.M.C., at Kitchener, Ontario, on April 2, 1949.

Lieutenant (Dietitian) Ellen E. S. Wright, R.C.A.M.C., previously of the staff of Toronto Military Hospital, was recently posted to Army Headquarters, Ottawa, as adviser in diabetics in the Directorate of Supply and Transport.

It was with great regret that the R.C.A.F. received news of the death of Dr. F. F. Tisdall of Toronto. Dr. Tisdall, who served as a Group Captain in the Second World War, continued to serve as Consultant in Nutrition to the R.C.A.F. and, in this capacity, was constantly interested in both the improving of

the ordinary messing and the necessary research and development required for northern rations and "in flight" feeding.

---

Group Captain J. A. Mahoney of the Directorate of Health Services, R.C.A.F., has just returned from a visit to the R.A.F. Medical Services. At the R.A.F. Institute of Aviation Medicine, Farnborough and other units, Group Captain Mahoney pursued investigations into mutual problems regarding the physiological aspects of modern flying.

The Institute of Aviation Medicine will be presenting two scientific papers at the 20th Annual Meeting of the Aero Medical Association in August, 1949, and Wing Commander G. D. Caldbick of the Directorate of Health Services will be presenting a paper to the Canadian Public Health Association in June, 1949.

---

Under the auspices of the R.C.A.F. Institute of Aviation Medicine, a meeting was recently held in Toronto on various aspects of physiological problems of National Defence. Appropriate officers attended from all Defence Services.

---

Matron Virginia Bransagger has recently returned, having successfully completed a flight nurse course at the School of Aviation Medicine, Randolph Air Force Base, Texas. This course is designed to give instruction in the basic concepts and practical phases of caring for patients transported by air. The first three months are devoted to the theoretical considerations and the final three months to practical execution of air flights. During the latter phase, over 200 hours of flying were carried out on actual transportation operations. Nurses trained in such work will be of great assistance in the success of the R.C.A.F. medical flights, particularly those arising from sick and injured in the far north.

---

Flight Lieutenant W. J. Wills was recently posted as Senior Medical Officer at Aylmer.

---

The following Medical Officers will represent the Armed Forces at the Annual Meeting of The Canadian Medical Association at Saskatoon: Surgeon Captain A. McCallum, Naval Headquarters; Surgeon Comdr. E. H. Lee, *H.M.C.S. Magnificent;* Surgeon Lieut. Comdr. J. C. Gray, *H.M.C.S. Naden*; Brigadier W. L. Coke, Army Headquarters; Colonel P. Tremblay, Army Headquarters; Lieut.-Col. E. H. Ainslie, Quebec Command; Lieut.-Col. A. F. Nancekivell, Central Command; Major A. C. Derby, Western Command; Group Captain A. A. G. Corbet, Air Force Headquarters; Wing Comdr. D. G. Nelson, Air Transport Command; Wing Comdr. B. R. Brown, Institute of Aviation Medicine, Toronto; Wing Comdr. B. C. Boles, Central Air Command.

# SPECIAL CORRESPONDENCE

## The London Letter

*(From our own correspondent)*

### THE CHANCELLOR AND THE NATIONAL HEALTH SERVICE

The austerity Budget which the Chancellor of the Exchequer presented to Parliament at the beginning of April brought cold comfort to all sections of the community, but it performed one salutary function in drawing the attention of his own party to the truth of the old adage about the impossibility of having your cake and eating it. From the medical angle the most significant part of his speech was the reference to the possibility of "imposing some special charge or tax in connection with the health services, both to help to finance them and to bring home to people generally the simple fact that they have to be paid out of taxation". This is a suggestion that has been noted before on more than one occasion, though never by a member of the political party at present in power. As a rule the suggestion has taken the form that if patients had to make a small token payment every time they consulted their doctors the number of unnecessary calls on the time of doctors would be materially reduced. The further psychological argument in favour of this suggestion is that people tend to value more highly what they have to pay for. The mere fact that the Chancellor even mentioned the possibility of such a special charge indicates the concern which the rising cost of the health services is causing to the Government.

### THE BRITISH MEDICAL GUILD

Having been advised by their legal advisers that its present constitution precludes it from any activity that might be construed by a court of law to be one that could legally be performed only by a trade union, the representative body of the British Medical Association has decided to form a parallel organization to be known as the British Medical Guild. The guild will in fact be a board of trustees, consisting of any or all of the members of the central council of the Association who have consented to serve. It will not have a separate membership, and its policy will be laid down by the representative body of the Association. It has been described as "a Trust Fund supported by voluntary contributions, and the trustees will be able to use the money thus collected as a financial weapon in disputes as a source of compensation for medical men who may suffer financial loss as a result of taking action advised by the Guild".

### MINERAL OILS IN FOOD

Another step forward in the safeguarding of the quality of the food consumed by the community is made by the order just issued by the Minister of Food, prohibiting the use of mineral oil as an ingredient of food manufactured for sale to the public. The necessity for this order has arisen as a result of the shortage of fats and the search of bakers (and housewives) for substitutes for the fats usually used for cooking purposes. Whilst there may still be no definite evidence concerning the harmfulness of pure medicinal paraffin when used for this purpose, there can be no doubt concerning the potential danger from other oils and, in the words of *The Lancet*, "prosecutions in Manchester and elsewhere have shown with painful clarity that some people will not hesitate to supply bakers with what is nothing more or less than crude motor-oil". It is interesting to note that in announcing the order the Ministry state: "In view of the harmful effects which might result from the indiscriminate use in this way of mineral oil, including medicinal paraffin, housewives are strongly urged not to purchase or to use these substances as substitutes for edible oils in home cooking".

### THE NURSES' BILL

The Nurses' Bill, which was given its first reading in the House of Lords early last month, and which is sponsored by the Minister of Health, is an attempt to carry into practice some of the recommendations of the Working Party on the recruitment and training of nurses which issued its report in 1947. The reconstitution of the General Nursing Council is one of the major changes involved in the Bill. Of the 34 members of the Council, 17 will be nurses and of these, 14 will be elected on a regional basis, and those elected must be engaged in nursing in the areas for which they are elected. Educational authorities will also be more strongly represented on the new Council, three members being appointed by the Minister of Education, and one of the two members to be appointed by the Privy Council will represent the universities. Training committees are to be set up in the regional hospital areas; these will have the direct duty of improving methods of training. Another clause empowers the General Nursing Council to

admit to the *Register* nurses trained anywhere abroad to a standard approved by the Council. This replaces the provision of the Nurses' Registration Act of 1919 which restricted such admissions to those Dominions which granted reciprocal treatment to British nurses. Although this Bill will not provide an immediate answer to the present acute shortage of nurses, it should prove of value from the long-term point of view.

WILLIAM A. R. THOMSON.

London, May, 1949.

# ABSTRACTS FROM CURRENT LITERATURE

## Medicine

**Early Neurosyphilis.** Kopp, I. N.: *New England J. Med.*, **239**: 1021, 1948.

Early neurosyphilis is most often asymptomatic and can be detected only by spinal fluid examination. Of the cases showing severe spinal fluid changes in early syphilis, 70 to 80% can be expected to develop parenchymatous neurosyphilis unless treatment is adequate. It is very necessary therefore that the common notion that syphilis of the nervous system is a late development must be revised. Normal spinal fluid in the first two years of early syphilis is no insurance, on the other hand, that neurosyphilis will not occur in future. In spite of what may be considered intense and adequate treatment with mapharsen, bismuth and penicillin this still may occur and it is therefore essential that for the patient's future safety spinal fluid examinations must be made during a period of years. If the spinal fluid is negative for 4 or 5 years after the primary lesion, whether therapy has been given or not, it is almost certain, in the author's opinion, that parenchymatous neurosyphilis will not develop in future. Early symptomatic neurosyphilis is not common but cerebro-vascular lesions may give rise to symptoms early in the disease, which may be the first evidence of the presence of syphilis. Of the author's series of 154 cases of asymptomatic neurosyphilis seen in 15 months, 15% were of less than two years' duration when first seen. It is advised that treatment for early syphilis cannot be considered satisfactory unless a spinal fluid examination is done before the patient is discharged. Adequate follow-up of a normal fluid requires that it should still be found normal 4 years after the primary lesion. In the first two years of the infection the detection of abnormal spinal fluid calls for additional penicillin. If great improvement or a normal fluid does not result within a year fever therapy should be given. If the infection is more than 2 years old when the significant spinal fluid changes are first found immediate fever therapy combined with penicillin is called for.

D. E. H. CLEVELAND

**Negative Results of Tocopherol Therapy in Cardiovascular Disease.** Donegan, C. K., Messer, A. L., Orgain, E. S. and Ruffin, J. M.: *Am. J. M. Sc.*, **217**: 294, 1949.

In this study 21 patients suffering from cardiovascular disease were followed for the effect of vitamin E upon their symptoms and upon the course of their disease. Seven of the patients had hypertensive cardiovascular without cardiac enlargement and 7 with it; the third group of 7 patients suffered from angina pectoris. The patients were investigated both clinically and from the laboratory point of view including electrocardiographs and x-rays. The medication was given alternately as placebos and vitamin E administration, care being taken to see that the patients did not know which they were receiving. The placebos and the tocopherol were given in periods of a month each throughout a total study extending between five and twenty months. The results indicated that the patients felt as well, if not better, during the period of placebo therapy than they did during the time of receiving vitamin E. There was no significant objective change in the clinical or laboratory findings during the periods of tocopherol administration.

The authors conclude that tocopherol therapy in their patients produced no appreciable benefit.

G. A. COPPING

**Therapy of Migraine.** Marcussen, R. M. and Wolff, H. G.: *J. Am. M. Ass.*, **139**: 198, 1949.

Migraine is a syndrome with certain easily identifiable features and a variety of associated phenomena. Characteristically, it is a periodic headache which is unilateral in onset, but which may become generalized. It may be preceded by visual disturbances, paræsthesias in the extremities or speech disorders. With the headache there may be irritability, photophobia, nausea and vomiting. The headache itself is the end manifestation of a chain of bodily changes set off by pernicious emotional states. This head pain is associated with dilatation of certain pain-sensitive arteries inside and outside the head.

The most potent agent available for the constriction of these painfully dilated cranial arteries is ergotamine tartrate. It is most effective intramuscularly in doses of 0.25 to 0.50 mgm. as early as possible after the pain appears. The patient should be taught how to give himself the medication so that he can get it within the first half hour of the headache. As an alternative, four 1 mgm. tablets should be taken sublingually as soon as possible after the beginning of the headache, followed by two such tablets every half hour until a total of 10 mgm. has been given in an one hour and a half. Ergotamine tartrate relieves headache within an hour in 80% of cases. When this fails, drugs which raise the pain threshold should be used. Amobarbital sodium (''amytal sodium'') 0.2 gm. by mouth, given at the same time as the ergotamine, will insure rest and relaxation, an integral part of treatment. Bed rest in a quiet, darkened room is essential during the pain and for at least an hour after the pain has subsided.

The importance of the patient-physician relationship cannot be overemphasized. Conspicuous among the factors contributing to the apparent effectiveness of any of these procedures are belief in the physician and the establishment of a clearly defined regimen. It must be borne in mind that migraine occurs in a setting of life situations and attitudes which result in accumulated emotional tension and fatigue. Therefore, more important in the treatment of such a patient is the identification of the stressful factors in his life which lead to the accumulated tension and fatigue set off a series of bodily changes which result in the migraine attack. Reduction in frequency and severity of attacks depends on identification and modification of stressful factor in the relationship of the patient to his environment. An important part of the treatment is to afford them ample opportunity to discuss whatever problems they feel are pressing, regardless of the apparent relevance to the problem of headache. The attention and support of a sympathetic and understanding physician who discusses and informs but does not judge is a major therapeutic agent.

J. PRESTON ROBB

**Disseminated Lupus Erythematosis Occurring among Student Nurses.** Ayvazian, L. F. and Badger, T. L.: *New England J. Med.*, **239**: 565, 1948.

A follow-up study on a group of 750 nurses who trained at a large municipal hospital between 1932 and 1946 revealed that three of thirteen deaths had been caused by disseminated lupus erythematosis. The etiology of this disease is unknown but these cases form support-

ing evidence of an allergic causation. In one it appeared to follow and progress from a local reaction to a Dick-toxin injection. In the other two there was a well-marked interval of time between routine prophylactic inoculations and the development of the disease. There is strong suspicion in all three cases that the disseminated lupus was an expression of a complex allergic response to the inoculation of a bacterial product.

NORMAN S. SKINNER

**Necrotic Lesions of the Leg in Arteriosclerosis.** Edwards, E. A.: *New England J. Med.*, **239:** 571, 1948.

Necrotic lesions of the leg, in arteriosclerosis, are as serious as the more common lesions of toe or foot. They may originate spontaneously from thrombosis of small arteries, or they may follow trauma or infection, in the presence of far-advanced arteriosclerosis. The prognosis is poor because infection is difficult to control and the thrombosis is likely to spread. Chemotherapy is essential and the prophylactic use of anticoagulants may be indicated. Femoral vein ligation may be advisable. While conservative treatment may be tried it should be promptly abandoned in favour of radical amputation if there is spread of necrosis or infection. NORMAN S. SKINNER

**The Use of Anticoagulants in the Treatment of Diseases of the Heart and Blood Vessels.** Wright, I. S.: *Ann. Int. Med.*, **30:** 80, 1949.

The author feels that the value of anticoagulants, dicoumarol and heparin in the treatment of thrombophlebitis has been conclusively established. The importance of the use of anticoagulants postoperatively in the prophylaxis of thrombo-embolic complications, too, has been clearly demonstrated. Data based on extensive studies indicate that the death rate from coronary thrombosis with myocardial infarction can be reduced one-third, and the incidence of thrombo-embolic complications can be reduced one-half by the use of anticoagulants.

The author believes that the majority of therapeutic failures to date have been the result of inadequate anticoagulant treatment. Some failures occur in spite of apparently adequate therapy. Hæmorrhagic complications occur in patients who have never received anticoagulants but are more frequent in those who have. These problems have been discussed. The value of anticoagulants in the prophylaxis and treatment of the thrombo-embolic complications of auricular fibrillation appears significant. The needs for and the requirements which should be fulfilled by an ideal anticoagulant have been outlined. S. R. TOWNSEND

**Skeletal Lesions in Hodgkin's Disease.** Falconer, E. H. and Leonard, M. E.: *Ann. Int. Med.*, **29:** 1115, 1948.

A cellular pattern, uniform in type, was demonstrated in the aspirated marrows of 59 patients with Hodgkin's disease. This pattern showed an increase of the myelocytic elements with emphasis on the neutrophilic and eosinophilic myelocytes, the band neutrophiles, eosinophilic segmented cells and the plasmocytes. This same cellular pattern was present in the aspirated sternal marrow of 12 patients, 10 of whom showed Hodgkin's lymphogranuloma in the marrow at autopsy. The marrows of 67 patients, including 18 autopsy cases, showed an increase of megakaryocytes when enumerated by a special technique with an established normal. This increase of megakaryocytes the authors interpret as indicative of marrow irritation and possible degenerative cellular changes. The authors believe the incidence of skeletal lesions shown by roentgenologic examinations is necessarily incomplete and too low, as marrows with Hodgkin's lymphogranuloma may contain lesions too small to involve the adjacent cortical portion of the bone.

S. R. TOWNSEND

**Aureomycin—A New Antibiotic.** Collins, H. S. *et al.*: *Ann Int. Med.*, **29:** 1077, 1948.

It can only be concluded that the effects of aureomycin in the present group of cases leave much to be desired. The possibility cannot be excluded that the use of larger oral doses, or parenteral therapy in proper doses may have a better effect in such cases. The relevant features in five cases of typhoid fever, three of severe salmonella infections, a case of colon bacillus bacteræmia, and a typhoid carrier, that were treated with the new antibiotic, aureomycin, are presented. The clinical and bacteriologic findings in some of these cases suggested that the aureomycin had some beneficial effects, but the results, in general are not striking. Concealed foci of suppuration may have been responsible for some of these failures. S. R. TOWNSEND

## Surgery

**Twenty-five Easy Ways of Getting into Trouble in the Case of Fractures.** Gurd, F. B.: *Am. J. Surg.*, **76:** 506, 1948.

This is the last paper read in public by the late Surgeon-in-Chief of the Montreal General Hospital. It summarizes in his inimitable way much of his wide experience, and in pointing out errors he emphasizes the fundamentals of modern fracture treatment. Most serious is the failure to assess the associated traumatic shock. Critical is the failure to diagnose concealed non-bony injuries. It may be wise to have another doctor witness that nerve or vascular injury is also present before the fracture is treated. Concomitant fractures may be picked up if the mechanism of injury is understood. The fourth error is failure to obtain adequate preoperative x-rays. X-ray films must be properly identified. Failure to interpret x-ray photographs is especially common in the carpal bones and pathologic fractures. Failure to recognize the mechanism of production of the injury leads to improper diagnosis. Inadequate records lead to criticism. Failure to notify all concerned of the prognosis is the final preoperative error.

During treatment, errors are listed as follows: delay in fixation, delay in reduction, inadequate reduction, undue roughness during reduction, repeated attempts at reduction, excessive padding under plaster. Technical errors during operation include: (1) inadequate or poorly placed incisions, (2) poor reduction before fixation (3) distraction of bone ends, (4) too short plates or too short screws, (5) improper metals. Errors of treatment of compound fractures cover: primary closure of contaminated wounds, delay in operation, inadequate operation and overconfidence in bacteriostatic drugs. During healing, failure to maintain close observation both physically and mentally, failure to check maintenance of reduction, maintenance of the limb in a non-physiologic position are to be avoided. Additional pitfalls are listed: application of an unpadded plaster while œdema is still present, failure to instruct in the use of appliances, too early mobilization or unprotected weight-bearing, delay in rehabilitation. The final warning is against too early and ill-conceived physiotherapy.

BURNS PLEWES

**Massive Extradural Hæmatoma.** Raaf, J.: *Am. J. Surg.*, **76:** 567, 1948.

Extradural hæmorrhage is found in 1 to 2% of acute head injuries. The usual source of bleeding is the middle meningeal artery or one of its branches, but a tear of a venous sinus or emissary vein may be cause of hæmatoma. The most constant sign is a lucid interval. Hemiparesis is a more reliable sign than altered reflexes. The Babinski reflex is often bilaterally positive. An ipsilateral dilated pupil was present in 8 out of 22 cases, and in 2 cases the dilated pupil was the contralateral side. Spinal fluid pressure is usually elevated, but may be normal or below. The hæmatoma must be evacuated with all speed. The patient must be brought to the

surgeon and his well-equipped operating room. One burr hole on each side of the skull is not enough to rule out extradural hæmatoma. A bone flap is usually better than an enlarged burr hole. BURNS PLEWES

**Cancer du duodénum.** Redon, H. et Albot: *Mém. de l'Acad. de Chir.*, **74:** 748, 1948.

Les auteurs rapportent en détail un cas personnel de cancer du duodénum opéré et guéri et dont le diagnostic clinique a été confirmé par l'examen radiologique, les constatations opératoires et l'examen anatomo-pathologique. Il s'agit d'un homme de 28 ans, très amaigri, dont les troubles digestifs remontent à plusieurs années et qui, en outre, avait été opéré récemment pour des kystes intracérébelleux. Le bilan azoté est fortement négatif. Avant l'opération pour cancer duodénal, on réussit à obtenir un équilibre protéique grâce à une large utilisation de transfusions, d'injections de plasma et de doses importantes d'hydrolysats de protéine et de lait sec écrêmé.

On constate la présence d'une cicatrice ulcéreuse juxta-pylorique et d'une tumeur duodénale flanquée sur son bord interne d'une masse arrondie (propagation tumorale). Opération en un temps. Section de l'estomac au niveau de l'antre pylorique; section au bistouri électrique du col du pancréas; la tranche de section du pancréas est suturée au fil non résorbable; le canal de Wirsung est répéré. Dissection de la veine mésentérique supérieure; section du cholédoque à sa pénétration dans le pancréas; section du duodénum à l'extrémité inférieure de la quatrième portion; anastomose gastro-jéjunale transmésocolique termino-latérale; fermeture de la tranche duodénale; abouchement du canal de Wirsung dans le cul-de-sac duodénal par suture directe sur un petit tube de caoutchouc; cette suture est renforcée par un plan pancréato-duodénal; suture cholédoco-duodénale sur la face opposée du moignon duodénal; reconstitution de la couverture péritonéale de la zone opératoire à l'aide du grand épiploon aminci. Lever du malade le septième jour. Bilan protéique largement positif dès le sixième jour.

Examen histologique: Epithélioma glandulaire typique envahissant toute l'épaisseur de la paroi duodénale avec propagation tumorale dans le tissu adipeux voisin; pas de ganglions décelables.

Malade revu en novembre 1948 en excellent état digestif.

Les auteurs formulent de multiples réflexions dont les suivantes: le cancer du duodénum considéré comme exceptionnel est encore mis en doute par certains; peu de chirurgiens ont réalisé la duodéno-pancréatectomie céphalique avec succès; la diagnostic reste essentiellement radiologique (la destruction muqueuse étant le signe majeur). Il faut penser au cancer devant les éructations fétides, en présence d'un ictère inexpliqué, d'une insuffisance pancréatique et d'une sténose duodénale quel qu'en soit le siège. L'opération en un temps semble préférable, sauf chez les ictériques et dans les sténoses duodénales en état de dénutrition. La mortalité moyenne de la duodéno-pancréatectomie doit se rapprocher de celle de la gastrectomie totale. PIERRE SMITH

## Obstetrics and Gynæcology

**Functioning Tumours of the Ovary, with Special Reference to Pathology and Histogenesis.** Novak, E.: *J. Obst. & Gyn. Brit. Emp.*, **55:** 725, 1948.

This paper is based on the correlated pathological and clinical study of 43 cases of dysgerminoma, 51 of arrhenoblastoma, and 161 of granulosa-cell tumour and thecoma. The probable origin of dysgerminoma from cells dating back to the early undifferentiated stage of gonadal development explains why this tumour-type produces no endocrinal effects. As regards masculinizing tumours, our ideas as to this histogenesis show an increasing departure from Meyer's simple concept of an origin from vestiges of masculine-directed cells persisting in the medullary portion of the ovary. This would still seem adequate in the explanation of arrhenoblastoma, a designation which includes all possible histological gradations of testicular structure-reproduction, always imperfect and often so highly abortive as to be almost unrecognizable. The theory does not, however, explain the masculinizing groups spoken of under such designations as virilizing lipoid tumour, adrenal cell tumour, masculinizing luteoma, and masculinovoblastoma. These seem better explainable by invoking the factor of the differentiating potency of the gonadal interfollicular mesenchyme, as has been discussed in the paper. It seems probable that the histogenesis is a varied one, and that at least some members of this group are of definitely adrenal character, with a probable origin from adrenal-cell embryological inclusions in the ovarian area. P. J. KEARNS

**Primary Carcinoma of the Vagina.** Way, S.: *J. Obst. & Gyn. Brit. Emp.*, **55:** 739, 1948.

Provided the tumour is likely to respond to the effects of irradiation, the author believes that radium is the method of choice in dealing with vaginal cancer and that if accurate apposition of the radium sources can be achieved many cases which have previously proved fatal may be saved. Radical surgery as the main line of attack on vaginal cancer in general will never be the method of choice for most people. The radical operation for carcinoma of the vagina is a formidable undertaking, much more serious than Wertheim's operation for cancer of the cervix, of which it is an extension; but it should not altogether disappear from the gynæcological armoury, because there are undoubtedly some tumours which, although limited, will not respond favourably to radium, and in these cases I believe that radical surgery will play a small but very important part. As an ancillary to radium, surgery is most valuable. When the groin nodes are likely to be involved the radical block dissection is vastly superiof to x-ray therapy, and in the iliac nodes I believe that the iliac adenectomy operation of Taussig may also prove superior to present methods of deep x-ray therapy. P. J. KEARNS

**A Statistical and Clinical Review of 107 Cases of Ectopic Gestation.** MacVine, J. S. and Lees, D. H.: *Brit. M. J.*, **1:** 263, 1949.

A series of 107 consecutive ectopic pregnancies occurring over a ten-year period is reviewed. The findings are compared with those of recent reviews. In respect to etiology we find little support for the time-honoured view that previous pelvic inflammation is all-important. We believe that previous operations on the pelvis are a predisposing factor, and we are strongly of the view that extratubal factors causing alterations in calibre of the lumen are an important cause. Diagnosis is considered in relation to symptomatology, pathological types and physical findings. Our figures show that carefully taken histories reveal a very much higher incidence of helpful diagnostic symptoms than has previously been reported. For example, we find a high percentage of those patients complaining of vomiting and faintness due to pain, of shoulder pain, and of irritative bladder symptoms.

The treatment of these cases has been orthodox in every way. The authors attach particular importance to the free use of blood preoperatively, without delaying the operation once the diagnosis has been made. ROSS MITCHELL

**Pain in Childbirth.** Report of the Subcommittee of the Medical Women's Federation: *Brit. M. J.*, **1:** 333, 1949.

The Subcommittee on Pain in Childbirth was set up by the Council of the Medical Women's Federation to obtain information regarding relief of pain in childbirth from married women doctors with children of their own. A questionnaire was sent to about 300 medical women and 196 replies were received from those whose youngest child is not over 10 years of age. Analysis of

the replies shows that women doctors who have themselves had children are almost unanimously in favour of relief of pain in childbirth. It was found that in the majority of cases the mothers did not dread a second confinement, and also that the memory of pain in childbirth faded quickly. There was a high incidence of forceps delivery in primigravidæ. No adequate explanation can be given for this. The majority of medical women are confined in private wards of hospitals and nursing-homes and the majority are cared for by obstetric specialists. This group of medically qualified mothers found chloroform by far the most effective anæsthetic agent. Most of these births took place before trilene came into wide use in obstetrics. The efficacy of gas-and-air and gas-and-oxygen appears to be enhanced by the presence of a trained anæsthetist. The small size of the sample precludes any definite opinion on the relative efficacy of the various drugs and sedatives given in the first stage of labour. The results, however, show considerable dissatisfaction with potassium bromide and chloral mixtures.

Out of a total of 409 mothers who answered the question, "Were you left alone longer than you liked?" 65 answered in the affirmative. Few mothers were made to walk about during their labours when they would have preferred to lie down. A rather large proportion of the mothers stated that they would have liked more complete relief, 123 out of 425 deliveries, or 29% in the first stage, and 103 out of 425 deliveries, or 24% in the second stage. The situation with regard to perineal repair appears to be satisfactory. No information can be obtained from this series regarding the value of antenatal exercises or of preparation for childbirth. ROSS MITCHELL

## Anæsthesia

**Convulsions Under Anæsthesia in Children.** Belinkoff, S.: *Current Res. Anæs. & Anal.*, **28:** 40, 1949.

Convulsions may appear in almost any childhood disease associated with a high temperature and usually no treatment is necessary since they disappear spontaneously in most cases. However, if muscular spasms occur when the child is under a general anæsthetic there is need for great concern because of the high mortality rate and the possibility of permanent damage due to anoxia. The etiology of convulsions occurring during the administration of a general anæsthetic can be divided into three groups: (1) *Anoxia.*—The significance of anoxia in producing convulsions is well known and pathologic changes especially with nitrous oxide have been demonstrated by Courville. Even with open drop ether a minor degree of anoxia may develop which continued over a long time may result in convulsions. (2) *Idiosyncrasies or toxic effects of certain drugs.*—Cocaine and its derivative are an excellent example of this. (3) *Unknown factors.*—This group comprise the largest number of reported cases. Many factors have been suggested as possible causes, including a neurotoxia from a neurotrophic streptococcus. So far no specific factor has been proved to be the responsible agent. Treatment in these cases is either intravenous sodium pentothal or an extract of curare.

The author describes three cases of convulsions exemplifying the above three etiological groups and outlines the treatment which was employed. Although sodium pentothal has long been accepted as the agent of choice in the control of convulsions under anæsthesia a new agent, curare, is now also available. The latter agent must be used with great care however as it may stop all breathing as well as the convulsions. In this case 1 c.c. of 1:200 prostigmin should be administered intravenously and artificial respiration carried out by manually squeezing the bag of a gas machine filled with oxygen, applying the mask firmly to the patient's face, until respirations are restored.

The usual immediate treatment of convulsions under anæsthesia is the slow intravenous administration of a 2.5% solution of sodium pentothal. If venipuncture is impossible, 20 c.c. of water containing 0.5 grams of pentothal should be injected rectally (2.5% of solution). The patency of the airway must always be assured and oxygen should be administered continuously.

F. ARTHUR H. WILKINSON

## Neurology and Psychiatry

**The Human Electromyogram in Response to Nerve Stimulation and the Conduction Velocity of Motor Axons. Studies on Normal and on Injured Peripheral Nerves.** Hodes, R., Larrabee, M. G. and German, W.: *Arch. Neurol. & Psychiat.*, **60:** 340, 1948.

Muscle action potentials in response to supramaximal percutaneous stimulation of various nerves were recorded in a number of normal subjects, in patients with peripheral nerve injuries and in a few persons with a condition diagnosed as hysterical paralysis. The potentials were recorded through small electrodes on the skin. Decrease in amplitude of the action potential after nerve injury indicated decrease in the number of muscle fibres innervated, while increase in latency of the response indicated slowing of the conduction velocity of the regenerating nerve fibres and, therefore, a decrease in axonal diameter.

The normal conduction velocities of the fastest nerve fibres supplying the intrinsic muscles of the hand and foot ranged from 46 to 67 metres per second. During recovery following nerve suture, and sometimes during spontaneous recovery of nerve function, the velocities were much lower, being accurately measured at less than 50% of normal in some cases, and estimated to be as low as 5 to 10% of normal in others. Velocity increased progressively during the first year after suture, but probably never regained more than 60% of normal. Since velocity is known to be directly proportional to the diameter of an axon, this implies a similar limitation in axonal growth after suture. In contrast, fibres of approximately normal velocity were found in several cases in which regeneration occurred without operation on the nerve.

After nerve suture, muscle action potentials in response to stimulation of the nerve were first detectable at a time which depends on the distance from the lesion to the muscle. The values indicated rates of regeneration in good agreement with the commonly accepted rates of 1 to 2 mm. per day. In general, reinnervation could be detected before an action potential could be recognized by watching for movement during a voluntary effort of the patient. In cases of hysteria or malingering the normality of the peripheral nerve and muscle could be definitely demonstrated. J. PRESTON ROBB

**Psychomotor Epilepsy.** Gibbs, E. L., Gibbs, F. A. and Fuster, B.: *Arch. Neurol. & Psychiat.*, **60:** 331, 1948.

The authors point out that psychomotor seizures are rare in children and common in adults. These seizures are rarely controlled by medication. They can occur in the absence of convulsions or petit mal seizures. They are as distinctive as most other types of nervous dysfunction, and in the majority of cases a diagnosis can be made on clinical grounds alone. At present, however, psychomotor epilepsy usually goes unrecognized or is misdiagnosed because no provision is made for it in the diagnostic classification. Of necessity, therefore, the physician classifies a case of psychomotor epilepsy under whatever heading seems to him the approximately appropriate one — for example, hysteria, psychopathic personality or schizoid psychosis.

The chief clinical manifestations of psychomotor seizures may be described as follows: The patient becomes confused and, as a rule, amnesic, but does not usually lose consciousness. His movements appear purposeful but are poorly co-ordinated, and his manner is frequently negativistic. In general, his behaviour is that of a person acting out a bad dream. Often, during the seizure

there are manifestations of fear or rage with screaming or shouting. In most seizures the movements are simple, repetitive and more or less automatic. Usually in the interseizure period severe personality disorders are present. These may be of such high degree that the patient is classified as psychotic. Irrespective of medication, hypersomnolence is common.

In all cases a spike focus could be demonstrated in the anterior temporal area on one or both sides in the electroencephalogram. This focus was most readily demonstrable during natural or induced sleep.

In view of the high association of personality disorders with psychomotor epilepsy, it seems reasonable to attribute much of what has been called the epileptic personality to disturbances in the anterior temporal area.

Patients with psychomotor epilepsy are rarely benefited by treatment with any or all of the antiepileptic substances at present available. The focus is located in an accessible "silent area". In severe cases surgical removal of the discharging region should be attempted.

J. PRESTON ROBB

**A Study of the Relationship Between Constitutional Variations and Fundamental Psychotic Behaviour Reactions.** Wittman, P., Sheldon, W. H. and Katz, C. J.: *J. Nerv. & Ment. Dis.*, **108:** 470, 1948.

This appears to be the latest contribution to psychiatry from the statistical analysis of behaviour in relation to body morphology. A classification of patients into three groups according to psychological and psychiatric criteria shows significant correlations with an independent classification of the same patients into three groups by measurements of their photographs. "Affective" features correlate positively with "endomorphy" and "mesomorphy" and negatively with "ectomorphy". "Paranoid" features correlate positively with "mesomorphy". "Heboid" features correlate negatively with "mesomorphy" and with "arm mesomorphy" and positively with "ectomorphy". However, there are even higher correlations between the psychological-psychiatric grouping and a grouping made by Dr. Sheldon including his own observations of the patients during the brief activity of photographing them. "Affective" features correlate well with "viscerotonic" and negatively with "cerebrotonic". "Paranoid" features correlate fairly well with "somatotonic" and negatively with "cerebrotonic". "Heboid" features correlate negatively with "viscerotonic" and "somatotonic" and very positively with "cerebrotonic". Dr. Sheldon's grouping could also be correlated with response to shock therapy, "mesomorphic" individuals responding best and "ectomorphic" individuals responding least. The authors conclude that a "constitutional analysis" can be useful for research but that for diagnosis "constitutional and temperamental evaluations are of most value if used in conjunction with other diagnostic evaluations". Although not of obvious significance for general medicine the findings of this group of workers are important for psychosomatic practice and research as well as for psychiatry.

W. DONALD ROSS

**The Practice of Psychiatry in a Rural Community.** Sirkin, J.: *Am. J. Psychiat.*, **105:** 775, 1949.

Various estimates have been made from time to time of the size of population which can support a psychiatrist in private practice and which really requires one for the sake of proper medical care. In this article the author gives an interesting and amusing account of the nature of his practice in a rural community where he acts as a qualified specialist in psychiatry for 70% of his time, and as a general practitioner for 30%. He is located in a town of 8,000 population and serves a county of 50,000 plus part of a wider area which also drains into larger cities 32 and 55 miles away. In this setting he appears to be rendering a valuable service to the community at large as well as to the other doctors and to the patients he sees in psychiatric consultation and treatment. He finds that the hours are longer than in specialty practice in a city because of some time spent in travelling. He charges fees for the psychiatric work comparable to those in urban practice, while he charges for his general practice the fees which are current among the local general practitioners. He finds that the income is equivalent to the services rendered, and that his only major source of dissatisfactions include lack of hospital facilities and isolation from other psychiatrists, both of which he feels could be overcome by association with a teaching psychiatric centre.

W. DONALD ROSS

## Psychology

**Life Situations and Serum Antibody Titres.** Bakke, J. L. and Wolff, H. G.: *Psychosom. Med.*, **10:** 327, 1948.

The authors have sought evidence to explain previously established facts: that persons with acute minor respiratory infections who have been hospitalized have a higher incidence of personality disturbances than such persons not hospitalized, and that individuals with personality disturbances are hospitalized longer for acute respiratory infections than those without them. They quote Selye's summary of the possible evidence that alarming stimuli may actually influence serum antibodies. They report negative results, however, in their attempts to correlate fluctuations in hæmagglutination-inhibition titres for influenza A and B virus, and streptococcus MG and cold agglutinins, with episodes of emotional stress, as recorded in the diaries of four healthy subjects. They believe that the relation of hospitalization to personality disturbance must have some other explanation, either in other, possibly local, vasomotor, factors of resistance to infection, or in psychological influences on the severity of symptoms experienced by such persons.

W. DONALD ROSS

**Psychologic Factors in the Etiology and Treatment of Chronic Headache.** Brenner, C., Friedman, A. P. and Carter, A.: *Psychosom. Med.*, **11:** 53, 1949.

These investigators in the department of neurology at Columbia have digested their experience with several hundred patients with chronic headache seen over a period of five years, and have presented a condensed account of the most important emotional factors to be found in association with headache, and of the management of these patients by a general physician or by a psychiatrist. A large proportion of such patients are suppressing, or are unconscious of, strong feelings of resentment or anger. Such patients can be helped greatly by an opportunity to express these feelings to a doctor, or by rearranging their lives so as to avoid sources of anger. Other patients suffer from a hysterical identification with someone with headache, or the conversion into symbolic pain of some other conflict, including a need for punishment, or an unconscious need for illness because of the secondary gain which such illness would provide by removing the individual from conflict. Such patients may or may not be curable by a psychiatrist. The preparation for referral to a psychiatrist involves the same listening to the patient's account of personal history which results in therapeutic benefit to the patients having bottled-up anger. This can lead up to the explanation that further talks with a psychiatric colleague may provide further help. It should not involve a premature attempt to interpret to the patient the kind of emotions which may be relevant. Such attempts at interpretation are particularly inadvisable in another group of individuals who have headaches as a hypochondriacal feature of a hidden psychosis. The importance of the physician-patient relationship is stressed as a therapeutic agent which operates unconsciously even when the patient is unable to recognize or admit that the doctor's personality has helped him.

W. DONALD ROSS

## Pathology

**Pathologic Reactions in the Livers and Kidneys of Dogs Fed Alcohol While Maintained on a High Protein Diet.** Chaikoff, I. L., Entenman, C., Gillman, T. and Connor, C. L.: *Arch. Path.*, **45:** 435, 1948.

In this experiment attempts to maintain dogs on a high protein diet while feeding them alcohol over a period of many weeks were not entirely successful. Accordingly, it could not be determined whether the pathologic changes found were due to associated irregular feeding habits and consequent malnutrition. However, definite interest does attach to the lesions which did develop. Particularly interesting was the finding of centrolobular hepatic fibrosis superimposed on the fatty changes in the livers of 7 of the 12 dogs studied. In several the fibrosis started within a centrolobular area of hæmorrhagic necrosis which was considered to be the result of some sudden alteration of the blood supply. In 2 dogs the fibrosis was severe enough to result in such gross structural distortion as to be regarded as frank cirrhosis. In the same 2 dogs, but in none of the others, there was also periportal fibrosis.

These findings corroborate other workers' observations that experimental hepatic fibrosis and cirrhosis commence in the centre of the lobules. Alterations of the blood supply in association with fatty change in the central portions of the lobules are thought to play an important part in stimulating this centrolobular fibrosis. In the kidneys damage to both glomeruli and tubules was detected. It was not possible to determine whether these lesions were secondary to hepatic damage or were due to either malnutrition or alcoholization more directly.

J. W. BAWDEN

**Coarctation of the Aorta and the Aortic Isthmuses.** Bremer, J. L.: *Arch. Path.*, **45:** 425, 1948.

In this review of coarctation of the aorta, the author re-emphasizes the distinction between the two well known types and re-examines from an embryologic point of view the common theories as to the causation of the newborn type of this anomaly. In the adult type of coarctation the stenosis of the aorta is always in the immediate vicinity of the ductus arteriosus—"rarely just above, usually below, always touching it". It is due to a fault of development in which the processes of closure of the ductus arteriosus, normally occurring at birth, extend abnormally to the aorta. In the newborn type the stenosis is found distinctly proximal to the aortic attachment of the ductus arteriosus, classically between it and the root of the left subclavian artery. The newborn type is connected with the presence during fetal life of the aortic isthmus—that segment of the aorta between the origin of the left subclavian artery and the entrance of the ductus arteriosus. The existence of such a narrowed segment is due to a normal degenerative process of the dorsal aorta between the 3rd and 4th aortic arches occurring about the seventh week of fetal life. The isthmus is a relatively stagnant section of the aorta in fetal life because arterial blood to the head, neck and upper extremities leaves the aorta proximal to it and arterial blood to the lower part of the body and legs enters the aorta through the ductus arteriosus distal to it. The subsequent fate of the isthmus depends on the volume of blood traversing it. With adequate circulation in fetal life it will remain open and will expand fully at birth. With minimal blood flow it may become increasingly narrow, or even close completely, and will be unable to open at birth in spite of the suddenly increased blood stream. The occurrence of the newborn type of coarctation of the aorta is explained on this basis.

J. W. BAWDEN

**Myocardial Changes in Poliomyelitis.** Dolgopol, V. B. and Cragan, M. D.: *Arch. Path.*, **46:** 202, 1948.

A series of 92 cases of fatal poliomyelitis was studied to determine the incidence of focal myocardial lesions attributable at autopsy to this disease. Acute focal myocarditis was found in 16 of the 92 cases. The lesions were divided into three types. The first showed degeneration of myocardial fibres isolating their nuclei which were preserved. The second were characterized by an infiltration of mononuclear cells about fibres which were relatively well preserved. The third of histocytic cellular collections around blood vessels with the addition of polymorphonuclear leucocytes and lymphocytes in some instances. The number and severity of the lesions was said not to bear any relationship to the duration of the poliomyelitis and the presence of inflammation in the lungs. The majority of patients died during the first 5 days of the illness. This myocarditis is similar to that seen in other virus infections and was thought not to be related to pneumonia or horse serum therapy which was given in 2 cases. With regard to the latter, the possibility that the patients had received horse serum at some time prior to the onset of the poliomyelitis and that this was in reality an anaphylactic dose, is not considered. The myocarditis is similar to that sometimes seen in sulfonamide allergy which is also not discussed in the paper. Four of the patients were said to have died of cardiac failure, but since all were cases of bulbar poliomyelitis and since the criteria for judging of cardiac failure are not stated, it is difficult from the evidence presented to assess the rôle of the lesions as contributory to death of the patients.

SIDNEY D. KOBERNICK

## Industrial Medicine

**Better Soaps for the Industrial Worker.** McCord, C. P.: *Indust. Med.*, **17:** 421, 1948.

In this article the author considers the physiologic needs of the human skin in relation to soaps and other detergents and with foremost concern for the individual worker. He first explains the procedure by which they appraised the detergent qualities of numerous household and industrial soaps. Many soaps which are very effective cleansers are not acceptable on a physiological basis. The importance of the skin's acid mantle is stressed; its preservation is of physiologic import. As the presence of alkalis from any source tends to deprive the skin of this protective coating, it is desirable that the detergent used be one that will exercise little or no destructive action on the skin's acid mantle.

Of all forms of soap available, powdered soap is best suited to the needs of industry. It is economical, readily dispensed, subject to little wastage and may contain scrubbers. Both cake and liquid soap have certain disadvantages. The abrasives (scrubbers) contained in the soap serve a useful function; similar to that of the well accepted wash rag. Of the different types, organic scrubbers are preferred; at the present time, cornmeal is the most favoured one. With any soap, thorough rinsing is essential. Reference is made also to alkali builders in soaps and to the action of superfatted soaps on the skin. Legal safeguards demand that the quantity of free alkali shall not exceed one-half of 1%. In connection with superfatted soaps it is the author's opinion that oily emollients tend to retard the immediate flow of sweat after bathing and on this account may hamper the rapid return of the acid mantle. The question of incorporating germicides in soap products is receiving attention today but as yet the inclusion of no germicide is sponsored as essential to a good industrial soap. For odor removal, resort to mild deodorants is preferable to excessive bathing.

The recent wide acceptance of a large number of synthetic detergents has led to considerable concern as to their place in the world of detergency. It has now been established that some synthetic detergents possess properties and actions that serve the requirements of skin hygiene. It is not expected however that there will be a quick shift to universal reliance on them. It is probable that the mounting sales now marking the synthetic output will lead to modification in hygienic soaps that will provide products better meeting physiologic needs, but it is not anticipated that soaps will disappear from use.

MARGARET H. WILTON

# OBITUARIES

**Le Dr J. Nelson Brunet** est décédé le 1er mars à son domicile, à St-Janvier, après quelques mois de maladie. Il laisse son épouse, trois filles, un frère.

**Dr. Frederick L. Burrows** died at Regina on April 11, at the age of 60 from cerebral hæmorrhage. Born in Manitou, Man., in February, 1889, Dr. Burrows and his parents moved to Swan Lake, Man., where he received his early schooling. In 1914 he graduated from Manitoba medical college and took charge of the Winnipeg children's hospital. In 1917 he moved to Wapella, Sask., where he practised until 1929. At that time he went to the University of Minnesota at Minneapolis, to study radiology. He came to Regina in 1930, accepting the position of radiologist at the Regina General Hospital. He remained in that position until February, 1934, when he one again entered private practice. He had been practising up to the time of his death. An active sport enthusiast, he was a member of the Wascana Golf and Country Club and had been a member of both the Regina and Caledonian Curling Clubs. He was an ardent hockey fan and fisherman. He is survived by his widow, his mother and one daughter.

**Dr. Raymond Vincent Connors,** a member of the staff of the Ottawa General Hospital for 20 years, died April 5 in Ottawa Civic Hospital after an illness of two years. He was 58. Dr. Connors served with the medical staff of the Department of Veterans' Affairs for several years. Born in Ottawa, he received his education at St. Patrick's School and Lisgar Collegiate, graduating from Queen's University in 1914 with his medical degree. He began his internship at the Ottawa General Hospital and finished at Misericordia Hospital in New York City and then joined the Canadian Army. He served overseas from 1916 until the end of hostilities, and in 1919 was discharged as a captain. Besides his widow, he is survived by a son, a daughter, two brothers and two sisters.

**Dr. John J. Danby** died on April 16 in Ottawa Civic Hospital. He was in his 83rd year. He was honoured by the Ottawa Medical Society when he had been 50 years in practice, had been prominent in Ottawa medical circles since 1919. He previously practised at Richmond. Born at Meaford, Ont., he was educated at Meaford and later at Trinity Medical School from which he graduated in 1891. He served as medical officer in World War I with Captain's rank. In World War II, he was president of the medical examining board of the R.C.A.F. Dr. Danby came to Ottawa in 1891, practised for a year and then moved to Richmond where he lived until joining the 207th Battalion in 1916. He returned to Ottawa in 1919 and engaged in government and private practice. He was on the staff of Ottawa Civic Hospital for many years. He was a member and elder of Stewarton United Church and a past master of Goodwood Lodge, Richmond, A.F. & A.M. In Ottawa, he was a member of Rideau Lodge. He was a past member of Ottawa Hunt and Golf Club and Rideau Curling Club. Dr. Danby was a past member of the Academy of Medicine and the Ontario Medical Association. Surviving, besides his widow, are two sons, one daughter and four sisters.

**Dr. Napoleon-Arthur Dussault** died in Quebec on May 1, aged 80. A graduate of Laval University, he studied in France and enjoyed a wide reputation as a surgeon. He taught at Laval University for a time and later became director of clinics at Hotel Dieu Hospital. He was treasurer of the French Medical Association in North America, a member of Quebec Battlefields Park Commission and a director of the Capitol Life Insurance Company. His widow and a son survive.

**Dr. Emma Leila Skinner Gordon,** aged 89, one of Canada's pioneer women in the medical profession, died on March 27 at her home in Toronto. A humanitarian, Dr. Gordon took a keen interest in the welfare of the less fortunate. Realizing the need for clinics, where poor women could receive prenatal and natal care, she founded the first out-patient clinic for women in 1906 in Toronto. This clinic was staffed by women doctors and grew from a one-bed to a seven-bed hospital. In 1915 Dr. Gordon, with the co-operation of Mrs. Peter Rutherford, organized the raising of funds for a 50-bed hospital, which was established on Rusholme Rd. She was head of the pædiatrics department of this hospital.

The Rusholme Rd. hospital was the forerunner of the present Women's College Hospital. Although not responsible for the building of the latter, she was an inspiration behind it. Dr. Gordon was born in Toronto and graduated from the Ontario Medical College in the mid-1890's, being one of the first women to enter the medical profession here. She retired in 1936. Dr. Gordon was interested in the youth of the city and in 1898 organized a small group of incorrigible boys into a religious and educational club. This was the nucleus for the Baraca and Philethea Society which is still active. She also founded the Merton St. Gospel Mission and was an enthusiastic member of the Women's Christian Temperance Union. A life member of the Women's College Hospital, she also belonged to the Academy of Medicine and Knox Presbyterian Church. Her husband survives.

**Dr. Robert Neil Kyles** died in Orangeville, Ont., on April 20 after several months' illness. He was in his 75th year. Born on a farm, north of Camilla, Ont., he graduated in medicine at the University of Toronto and started practice in Orangeville in 1902. He continued in practice until September, 1948, when illness forced him to retire. He attended St. Andrew's United church and served it for many years as an elder. He is survived by his widow, two sons, two brothers and two sisters.

**Dr Michel-Philéas Lambert** est décédé à sa résidence de St-Romuald, le 16 avril, à l'âge de 83 ans. Il a pratiqué la médecine pendant 56 ans à St-Romuald, et sur la rive sud ou il était grandement estimé. Il laisse son épouse, cinq fils et cinq filles.

**Dr. Carlton G. Lee,** aged 57, formerly of Winnipeg, died at Highland Falls, N.Y., on March 25. He graduated from the University of Manitoba in 1916. He served with the Royal Canadian Air Force in the first world war and in the United States Army Medical Corps during the second world war. In 1927, Dr. Lee began his practice in Highland Falls.

**Dr Louis-Charles LeSage** est décédé à Montréal le 7 avril à l'âge de 57 ans. Il était le fils du Dr Charles LeSage, ancien député du comté de Dorchester aux Communes. Originaire de Lévis, le défunt habitait Montréal depuis 35 ans. Il laisse sa femme, deux fils, son frère, le Dr Albert LeSage, et deux sœurs.

**Dr. Edward James Lyon,** Prince George physician, died in Vancouver on March 22, after a short illness. Born in Guelph, Ontario, in 1880, he graduated from the University of Toronto and came to Prince George to practise in 1916. He was an active member of the Rotary Club and Elks Lodge. He is survived by his widow, a son, a daughter, five grandchildren and four sisters.

**Dr. A. A. McIntyre,** aged 73, died on April 24 at his home in Glencoe, Ont. He had lived in Glencoe 40 years. He was born near Dorchester. Surviving besides his widow, and two daughters, is a sister.

**Dr. John J. McMahon** of New York, died unexpectedly of a heart attack on April 15, in St. Clare's Hospital, at the age of 71. Born in Toronto, he graduated from Ottawa College and then entered the medical school of the University of Toronto, from which he received his M.D. in 1899. He then established himself

in New York. Surviving are his widow, a daughter, three sons and two sisters.

---

**Dr. Demetrius Mallin**, aged 66, died on April 30 at the Toronto General Hospital. He came to Canada from Bulgaria in 1908 as a church organizer. Travelling extensively throughout Canada and the United States, he built many churches, including the Bulgarian Eastern Orthodox Church in Toronto, of which he was a member and past president. He compiled and published the first English-Bulgarian dictionary. Later Dr. Mallin decided to study medicine and graduated from the University of Toronto in 1920. He established a practice in Toronto, and was on the executive of the Rosedale Progressive Conservative Association. Surviving are his widow, a son and a brother.

---

**Dr. Armand Roy**, aged 59, of Wotton, Que., district coroner and well known in the Eastern Townships, died in hospital March 27 after two days' illness. Born in Montreal, he graduated in medicine from the University of Montreal. Surviving are his wife and two sons.

---

**Dr. William A. L. Styles** of Montreal, died suddenly April 13, aged 67, while visiting his wife's family in Bridgeport, Conn. A graduate of McGill University and St. Mary's College, Dr. Styles held the degrees of M.D. and C.M. A former lecturer at McGill University, he was particularly interested in the University Settlement. He retired from active practice some 10 years ago. Dr. Styles was well-known as a student of Canadian social history and was a former editor of the *Franciscan Review* and a writer for many Roman Catholic and health magazines. He was one of the co-founders of the Federation of Catholic Charities and was instrumental in bringing the Rockefeller Foundation to Canada. He was a past member of the Montreal Council No. 284, Knights of Columbus and in the 1920's was editor of the Knight News. He was also a member of the Third Order of St. Francis and was actively interested in the Griffintown Boy's Club. He is survived by his widow and two sons.

---

**Dr. Frederick F. Tisdall, M.R.C.S.(Eng.), L.R.C.P. (Lond.), F.R.C.P.[C.]**, died suddenly on April 23 at his farm in Thornhill. He was 55. The day before his death Dr. Tisdall attended ceremonies of laying the cornerstone at the Hospital for Sick Children, with which he had been long associated. Dr. Tisdall had been an outstanding figure in Canada for more than 20 years. He was assistant professor of pædiatrics at the University of Toronto; director of laboratories and research at the Hospital for Sick Children; chairman of the nutrition committees of both the Canadian Medical Association and the Canadian Red Cross Society; and a member of the food and nutrition board of the National Research Council, Washington, D.C. In the Second World War he was the originator of the prisoner-of-war food packages which were sent to war prisoners by the Canadian Red Cross Society.

Dr. Sidney Smith, president of the University of Toronto, has paid the following tribute to Dr. Tisdall.

"The passing of Dr. Tisdall has saddened the university community. He was a crusader for the health of the children whom he loved, and for whom he poured out his energy and his care. He was recognized at home and acclaimed abroad as one of the world leaders in the field of nutrition. He was not an impersonal research man. He was a generous colleague, a loyal friend, a lover of his fellowmen and a fine citizen."

Dr. Tisdall was born at Clinton, Ont., November 3, 1893. He graduated from the University of Toronto in 1916 in medicine. He served three years with the Royal Canadian Army Medical Corps and from 1920 to 1921 was a member of the staff of Johns Hopkins University, Baltimore. Prior to the Second World War his researches into diet, and particularly of vitamin D in bread, won him wide renown. His name became widely known through the oft-quoted Tisdall Report on basic diet requirements which he had prepared for Toronto relief authorities. During the last war, as a captain in the R.C.A.F. and special nutrition consultant, he surveyed servicemen's diets and nutrition standards among civilians in wartime Britain. He was awarded the O.B.E. for his distinguished services. More recently he conducted a survey among Indians in the Canadian North.

He was a member of the editorial boards of numerous scientific journals; a contributor to many textbooks on nutrition and author and co-author of more than 150 scientific publications. His hobbies were fishing, shooting and his farm at Thornhill. He was twice married, to Bessie Alberta Woodland and to Mary F. McTaggart. He had four sons. A brother, Charles P. Tisdall of Toronto, also survives.

---

**Dr. Harry Winter**, aged 37, died at the home of his father, in Toronto, on April 20 of coronary thrombosis. He returned to Toronto last summer from London, England, where he specialized in thoracic surgery. A few months ago he opened an office in Toronto. During the raid on Coventry, Dr. Winter directed operations which resulted in the rescue of every patient from the Coventry and Warwickshire Hospital that night. Later, working under candlelight, he performed surgical operations as bombs fell on the hospital. The gallant part played by the Toronto doctor in the Coventry blitz won recognition from the King. A graduate of the University of Toronto in 1936, Dr. Winter interned at St. Joseph's Hospital, Vancouver, and later was ship's surgeon on the cable ship, *Restorer*. He served in the Second World War with the R.C.A.M.C. He continued in service with the Army of Occupation in Holland after the war. Following his discharge from the army, Dr. Winter took postgraduate study at Edinburgh, where he received his F.R.C.S. degree. He was for a time on the staff of the Hospital for Consumption and Diseases of the Chest at Brompton, London. Dr. Winter was unmarried. Surviving are his father, three brothers and two sisters.

---

**Dr. Harold A. Woodside** died in the Moose Jaw, Sask., General Hospital on April 20 at the age of 56. Born in Port Arthur, Ont., he received his early education in Port Arthur schools. He was a graduate of Queen's University and completed his medical training at the University of Manitoba. During the First World War he served with the Queen's Medical Corps. He first practised in Southern Saskatchewan. During the drought years, he was the only doctor serving a large section of that part of the province. He later moved to Moose Jaw and practised there until taken ill a year ago. Surviving are his widow, two sons, a daughter, a brother and four sisters.

# NEWS ITEMS

## Alberta

Dr. James Cardy has been certified as a Specialist in Pathology by the American Board of Pathology. Dr. Cardy is a graduate of the University of Alberta and after his war service with the R.C.A.M.C. went to the University of Minnesota on a fellowship. Dr. Cardy will be returning to the Department of Pathology at the University of Alberta.

---

Dr. Raymond W. Burnap of Edmonton, has been made a Diplomate of the American Board of Anæsthesiology, following the recent exams by this Board.

---

Dr. Gordon Bell of Edmonton, was made a Fellow of the American College of Physicians at its recent meeting in New York.

---

Dr. Logan Fairbairn has been made President of the Calgary Medical Society. Dr. Walter Johns was made Vice-President, and Dr. John Porter Secretary.

Dr. Arthur Haig, Dr. J. K. Biglow, Dr. H. B. Hunt and Dr. B. B. Fowler of Lethbridge attended the Sectional meeting of the American College of Surgeons in Edmonton during April.

Dr. Hugh Stuart of Calgary was in Edmonton attending the American College of Surgeons meeting in April.

Dr. D. G. Revell, Emeritus Professor of Anatomy at the University of Alberta is enjoying a well earned rest on Vaucouver Island; Dr. Revell is visiting with his son Dr. D. Revell.

Dr. Smith Gardner of Calgary was the guest speaker at the Edmonton Academy of Medicine. A most enjoyable and instructive address was given by Dr. Gardner upon "Low Back Pain"; his method of approach to this difficult topic was original and effective. We hope more men come up from the south and instruct us in the north in like manner. W. CARLETON WHITESIDE

Dr. Vance Macdonald, a graduate of the University of Alberta, has returned from London, England, following three years of training in neurosurgery. Dr. Macdonald is confining his practice to neurosurgery in Edmonton. In 1938 Dr. Macdonald went to England for postgraduate work and was there when he was appointed private surgeon to the Duke and Duchess of Sutherland while on their world cruise in 1939. When war broke out he immediately joined the British Army Medical Corp. At Dunkirk he was wounded and taken prisoner of war; he was taken to a prison camp in Italy where he escaped and rejoined his service now the Eighth Army in Africa, here he was wounded on two occasions. Following his convalescence he was sent to North West Europe with his surgical unit and finished the war with a promotion to Lieut.-Col. a Military Cross and a Mention in Dispatches. We welcome Dr. Macdonald to the Province and city of his birth and wish for him all the success which will come his way.

Dr. Donald Wilson of the University of Alberta Medical Staff was awarded the Markle Scholarship of $25,000, the purpose of which is to promote and improve the teaching standards of the Medical School and research work therewith. We congratulate Dr. Wilson on his attainment and will watch with interest the great values he will promote in this direction. It will be remembered that Dr. Wilson is a Rhodes Scholar from the University of Alberta and served with the R.C.A.F. during the war.

Dr. A. H. Mercer, Pathologist of Lethbridge will have as his guest at the forthcoming British Commonwealth Medical Federation meeting his cousin, Dr. J. O. Mercer, M.R.C.P., Pathologist of Wellington, New Zealand. Dr. Mercer is also Editor of the *New Zealand Medical Journal* and is the representative from that country to the meeting in Saskatoon in June.

## British Columbia

The annual meeting of the Vancouver Medical Association is to be held on May 3, when the officers for the coming year will be elected, reports of the year's work given, and one or two important resolutions presented. Following the business meeting, the Association will be addressed by the well-known Canadian writer and speaker, Mr. Clyde Gilmour. His subject will be "Publicity—Good Medicine for the Doctor".

The B.C. Cancer Drive was inaugurated on April 18. Sixty committees are working throughout the province, under the chairmanship of Mr. George Tidd. Hospitals, fraternal organizations, Boards of Trade, the churches, and other public bodies, are all taking part in the drive.

Another campaign the Easter Seal campaign, sponsored by the 23 Lions' Clubs of the province, is now under way, and has already brought in considerable money. The proceeds are to go to the Children's Hospital and the Preventorium in Vancouver, the Queen Alexandra Solarium in Victoria, St. Christopher's School and the Spastic Paralysis Society of B.C.

The Red Cross Drive for funds is also proceeding from Whitehorse, Y.T., in the extreme north of the province to White Rock, B.C. on the U.S.A. border. Six thousand Chinese in Vancouver will be asked to contribute as a group, and altogether there is a great deal of support being given to the drive.

A refresher course, sponsored by the provincial health department, was given to public health nurses and sanitary inspectors of the province from April 19 to 22. The meeting was held in Victoria, and some 90 public health nurses and 21 sanitary inspectors were in attendance. The guest speaker was Dr. Ernest L. Stebbins, professor of public health administration, and Director of the School of Hygiene and Public Health at Johns Hopkins University, Baltimore.

The cost of social assistance in British Columbia is rising steadily. In Vancouver we are told that it has risen by 64% in the past year; as an example in March, 1949, the cost was $163,432 as compared with $99,200 in March, 1948. Old age pensioners and holders of mothers' allowances were 14,188 as compared with 11,683 in these two compared months.

An attempt is being made to render the hospitals of British Columbia self-supporting, and to eliminate deficits which have been the constant feature of hospitals here for so long that they have ceased to be an object of remark. This is being done by the Hospital Insurance Fund, which has surveyed the various hospitals, and fixed the basic rates paid from the Fund in accordance with this aim. As an example, when the Hospital Insurance Fund went into effect, the basic rate at the Vancouver General Hospital was $6.00 daily. This, of course, did not include x-rays, drugs, laboratory work, etc. Now it is fixed at $13.00 a day, and for those who do not have hospital insurance, *e.g.*, visitors from other parts of the world, hospitalization is rather costly.

Hospitals in Victoria benefit from the will of Mrs. Harriet Hatch, whose husband, the late John Newbury Hatch, a pioneer merchant in the Orient, had also been a notable philanthropist. The Victoria Baby Clinic was set up under his will. Mrs. Hatch left $10,000 legacies to each of the following: Queen Alexandra Solarium and the Royal Jubilee Hospital. She also left $5,000 to the Victorian Order of Nurses.

Another generous woman, Mrs. Mary Catherine Fisher of Vancouver, left in her will large sums to various organizations—among other gifts being $10,000 to the Victorian Order of Nurses, and $5,000 to the Vancouver General Hospital. She also left $50,000 to the University of British Columbia, to be used in setting up a chair of medicine in the new Medical Faculty.

J. H. MACDERMOT

## Manitoba

Dr. Alexander Gibson and Dr. P. H. T. Thorlakson of Winnipeg attended the sectional meeting of the American College of Surgeons, April 12 and 13, in the Macdonald Hotel, Edmonton. Dr. Gibson was moderator of a discussion on the "Differential Diagnosis and Treatment of Back Pain", and Dr. Thorlakson read a paper on "The Management of Acute Diverticulitis and its Complications".

The University of Manitoba has decided to add a third year to the Pre-Medical course; *i.e.*, three years from Grade XI (Junior Matriculation).

Dr. S. Vaisrub has opened an office in the Boyd Building, Winnipeg, for the practice of Internal Medicine.

Dr. F. Robert Tucker, after over three years postgraduate work in England, has returned to Winnipeg and is now associated in orthopædic work with Dr. Alexander Gibson.

The refresher course of the Faculty of Medicine, University of Manitoba, from April 19 to 22, was very successful. Fifty-one were registered for the course. The visiting speakers were Dr. H. B. Van Wyck, Toronto, Dr. Richard V. Ebert, Superintendent Veterans' Hospital, Minneapolis, and Dr. Arnold Jackson, Madison, Wis. Clinical meetings were held in the Winnipeg General Hospital, St. Boniface Hospital, Children's Hospital, and Deer Lodge Hospital. On the evening of April 22, Dr. Jackson and Dr. Ebert addressed the Winnipeg Medical Society. ROSS MITCHELL

## New Brunswick

Dr. R. E. Washburn of Saint John attended the recent meeting of the American College of Physicians in New York.

Dr. R. H. Morrissey and Dr. C. J. Duffy have been appointed clinicians in charge of the Newcastle-Chatham Cancer Diagnostic Clinic. This clinic will serve the two towns mentioned.

Dr. H. S. Wright of Fredericton presided at the spring meeting of the Medical Council of New Brunswick held in Saint John. The chief business of this session dealt with a large number of applications for enabling certificates demanded by so-called displaced physicians. It is so difficult to assess the professed claims of these physicians that this council refuses all demands unless supported by satisfactory evidence of competence proved during a considerable stay under observation in Canada. In this connection correspondence from Dr. Bramley Moore describing how such applications are screened in Alberta was read with real appreciation and approval.

Dr. Charles L. Gass of Sackville received the fellowship in the American College of Physicians at their recent meeting in New York.

Dr. Gordon B. Gaulton of Saint John has completed the annual postgraduate course in anatomical and clinical otorhinolaryngology at the Indiana University Medical Centre at Indianapolis.

Dr. S. S. Bland of Andover, and Dr. D. R. MacRae of Saint John, have been granted bursaries for study at the Memorial Hospital in New York by the Canadian Cancer Society, New Brunswick Division.

Dr. Hector H. MacKinnon, of Fredericton was made an associate of the American College of Physicians at the last meeting of the College of New York.

Dr. K. A. Baird of Saint John, presented a paper at the annual meeting of the American College of Allergy at Chicago.

The regular monthly meeting of the Saint John Medical Society was held on April 21 at the Admiral Beatty Hotel. The president, Dr. Geo. White was chairman. Dr. Lachcan MacPherson, the guest speaker discussed "The Diagnosis of Non-tuberculous Pulmonary Disease", putting special emphasis on cystic disease in the chest. He reviewed a series of his own cases and described the methods of differential diagnosis and treatment. A. STANLEY KIRKLAND

## Nova Scotia

Dr. L. M. Morton, Yarmouth, has returned from Florida where he spent the winter.

Dr. J. M. Ballem of New Glasgow, has been appointed by the Government to the Provincial Medical Board for a period of three years.

It is reported that a portion of a skull, presumably of a dinosaur, has been discovered in Pictou County and the finders are impatiently awaiting the return of Dr. G. H. Cox, noted naturalist, of New Glasgow to identify it. Dr. Cox has been spending the winters in Florida.

Dalhousie Medical School is graduating 43 physicians this Spring. All of these have had a year of internship, are eligible to write the examinations of the Medical Council of Canada, and may then register at will. A considerable number will remain in Nova Scotia filling most of the practices available.

Dr. C. H. Best of Toronto will receive the degree of Doctor of Laws, *honoris causa,* from Dalhousie University at the Spring Convocation on May 17. His many friends in Canada and particularly in the Maritimes congratulate him on this well deserved recognition of his great contribution to Canadian Medicine.

Dr. John Reid of Truro, who has been ill for several months is able to be about again though not sufficiently recovered to resume his practice. H. L. SCAMMELL

## Ontario

The County of York Law Association and the Academy of Medicine of Toronto held an inaugural dinner meeting of the Medico-Legal Society of Toronto on May 4. The officers are: Honorary Presidents, Hon. Leslie Blackwell, K.C. and Dr. W. E. Gallie; President, T. N. Phelan, K.C.; Vice-president, Dr. George F. Boyer; Council, medical, Dr. E. H. Botterell, Dr. Hurst Brown, Dr. W. A. Burr, Dr. J. A. MacFarlane, Dr. R. H. Malyon, Dr. Florence McConney, Dr. W. L. Robinson, Dr. A. Stokes, Dr. H. B. VanWyck, legal, Mr. G. E. Edmonds, K.C., Mr. E. L. Haines, K.C., Mr. I. Levinter, K.C., Mr. Paul H. Mills, Mr. G. R. Munnock, K.C., Mr. J. W. Pickup, K.C., Mr. B. J. Thomson, Mr. A. H. Young, K.C., Mr. P. D. Wilson, K.C., Dr. K. G. Gray, K.C., and Professor Joslyn Rogers. The opening address was given by Mr. T. N. Phelan, K.C., on "Expert Evidence Rules".

The Medical Library Association held its annual meeting at Galveston, Texas. One hundred and sixty-four members were present. Canadians attending were Miss E. Gordon and Miss T. Sears of McGill, Miss Agatha Leonard from University of Toronto and Miss M. Patterson of Toronto Academy of Medicine Library.

University of Western Ontario has received a grant of $30,450 from the Life Insurance Medical Research Fund. Dr. Alan C. Burton will have $11,550 for his work on the equilibrium and reactivity of small blood vessels; Dr. George W. Manning will have $8,400 for studying the effects of hæmorrhage, and Dr. E. M. Watson will have $8,400 for research in cardio-vascular renal disease in diabetic animals.

Toronto's annual toxoid week was held from May 1 to 7, there were no cases of diphtheria in the city in 1948, five cases with one death occurred in 1947.

Kirkland Lake is carrying out an experiment in educating mentally deficient children, the principle of their training is to improve the children's social adjustment and prepare them for employment. Two specially trained teachers conduct morning classes daily. The class of fifteen ranges in age from 8 to 18 with an average mental age of less than five years.

Dr. John Sheahan of St. Catharines was elected president of the College of Physicians and Surgeons of Ontario at the 84th annual meeting. Vice-president is Dr. Ward Woolner of Ayr. Committee members are: Executive, Dr. F. Etherington, and Dr. J. F. Sparks, both of Kingston; Dr. J. H. McPhedran, Toronto and Dr. Ward Woolner. Discipline: Dr. M. H. V. Cameron, Toronto; Dr. F. Etherington, Kingston; Dr. J. C. Gillie, Fort William; Dr. R. S. Murray, Stratford; Dr. A. L. Richard, Ottawa; Education and Registration: Dr. J. F. Argue and Dr. A. L. Richard both of Ottawa; Dr. J. A. Dauphinee, Toronto; Dr. G. A. Ramsay, London; Dr. D. S. Wigle, Windsor; Legislation, advisory, rules and regulations: Dr. J. F. Argue, Ottawa; Dr. J. C. Gillie, Fort William; Dr. C. E. Hill, Lansing; Dr. J. H. McPhedran, Toronto; Dr. G. A. Ramsay, London; Dr. J. F. Sparks, Kingston; Dr. D. S. Wigle, Windsor; Finance, printing and property: Dr. M. H. V. Cameron, Dr. J. A. Dauphinee both of Toronto; Dr. C. E. Hill, Lansing; Dr. R. S. Murray, Stratford and Dr. R. W. Schnarr, Kitchener.

---

Dr. Robert Laidlaw, chairman of the board of trustees, laid the cornerstone of the new Hospital for Sick Children on April 22. Mr. J. Grant Glassco, vice-chairman of the board said this was the sixth home of the Hospital for Sick Children. The original hospital, with 14 cots, was founded in 1875. Mrs. W. C. French flew to Toronto from Evanston, Ill. to be present at the ceremony. She is the daughter of Mrs. Samuel McMaster who founded the original hospital. Since 1945 when the campaign for funds began, building costs have risen at the rate of 1½% a month. The board is now faced with the problem of raising another $4,000,000 before the building can be completed.

---

Dr. G. D. W. Cameron, Deputy Minister of National Health and Welfare when addressing the Canadian Institute of Sanitary Inspectors in Toronto said that the problem of mental health presents the biggest challenge of our time. The great need for research in this field had prompted the large federal grant, most of which will be spent in training workers for mental hospitals. He mentioned the $200,000 grant for public health research this year stating that it will increase each year to the limit of $5,000,000. He hoped this grant would be used to augment the number of public health units and for the improvement of public health laboratories.

---

Dr. G. P. Jackson, M.O.H. Toronto, has been elected as the first president of the newly-formed Public Health Association of Ontario which is to be part of the Canadian Public Health Association.

---

Dr. Harold Couch of Toronto gave a paper on "Primary Care of Injured Hands" at the 143rd annual meeting of the Medical Society of the State of New York held in Buffalo in May. Dr. Carl Aberhart led the discussion on a paper entitled "Ureterointestinal Anastomosis by Direct Elliptic Connection".

---

The first Canadian clinic and nursery school for the treatment of cerebral palsy in children was officially opened in Toronto by Mr. Robert Laidlaw, chairman of the board of the Hospital for Sick Children, which sponsors the clinic at Carlton Street United Church where the clinic is to be carried on at present. The Junior League has provided the money and has done most of the work of organization. Miss Paula Egle, director of the Variety Club Cerebral Palsy Department of the Children's Hospital, Buffalo, came over for the opening. She told how treatment of these children had grown in the United States. Seven years ago, when the clinic opened in Buffalo not even the children's parents would discuss the affliction. Children with cerebral palsy are often very intelligent and workers were trying to plan some future occupation for each child by studying his ability and the extent of his handicap. Staff in charge of the Toronto clinic are: Dr. W. T. Mustard, Dr. W. A. Hawke, physiotherapists, Miss Gene Williams and Miss Vaida Henderson who have had special training in Buffalo. Mr. John Todd was the carpenter who made the special furniture for the children's use.

---

Dr. A. G. Smith addressed the Clinical Society of the Toronto Western Hospital on "The Problem of the Elderly Patient". He warned the members against making sudden changes in the mode of living among these people. New ideas must be brought forward gradually.

---

More than 300 nurses attended the Ontario Registered Nurses Association 23rd annual meeting in Ottawa. Though this Association represents 6,400 nurses in the province it is the one professional group which does not control its own educational standards. The Associations of eight other provinces have this control. The nurses have brought forward a draft bill proposing that the nursing profession be given control of nurse education and registration and that all paid nurses in Ontario be licensed. So far they have been unsuccessful in having this bill introduced to the provincial legislature.

---

Dr. Harold Ansley, graduate of the University of Toronto, has been appointed director of health services in the Department of National Health and Welfare, Ottawa. From 1930 to 1932 he was with the Standard Oil Company in South America. After further postgraduate work he became Ontario provincial pathologist, later director of epidemiology. He served with the R.C.A.M.C., was officer in charge of civil affairs public health work at Canadian Army headquarters in Holland, later with the British in Schleswig-Holstein. He joined the federal government in 1946 to become assistant director of health services.

---

The Diabetic Association of Ontario was organized in Toronto on May 2. It is a group of lay people who are either diabetics or deeply interested in those who have diabetes. In general terms its object is to enable the diabetic to make a full contribution to society. Dr. C. H. Best has been appointed honorary president and Dr. Eliott P. Joslin of Boston has been elected an honorary member. A council of nine laymen and women were elected to manage the affairs of the society.

---

Dr. A. R. Hagerman has been elected president of the Toronto Academy of Medicine. LILLIAN A. CHASE

---

Fifty years after his graduation, Dr. William Goldie proposed the toast to the graduating class of 1946 at their class dinner and sketched the teaching and practice of medicine half a century ago.

---

The Auxiliary of St. Joseph's Hospital, Toronto, presented the hospital with two oxygen tents, a physiotherapy machine, a bandage cutting machine and a cash gift of $2,000.

---

A week long canvass to raise funds for a 21-bed hospital in Uxbridge, Ont., started on April 25. The Uxbridge Cottage Hospital will serve Brock, Reach and Scott townships in Ontario County and part of Georgina township in York. Dr. Joseph A. McClintock and Dr. Frank E. Mallow are taking a prominent part in the drive.

---

At Caledon, Ont., on April 25, Dr. James T. Thomas was honoured by his patients after 33 years' service there. For 30 years he acted as health officer and for 17 years as Coroner. Dr. Thomas is an ardent fisherman and hunter and founded the Caledon Mountain Hunt Club.

---

The D. C. Balfour Lectureship in Surgery annual lecture was given by Dr. Waltman Walters, B.S., M.S., M.D., D.Sc., LL.D., Professor of Surgery at the Mayo Foundation on April 26 at the University of Toronto.

He spoke on "Twenty-five Years of Biliary Tract Surgery". NOBLE SHARPE

## Quebec

Le Docteur A.-N. Turcotte a été réélu à la présidence de la Société médicale de Québec.

Medical Fellowships of the Commonwealth Fund of New York have been awarded to Drs. Jacques Durivage and Charles Read, both of Montreal.

Le Professeur agrégé Albert Jutras, chef de service à l'Hôtel-Dieu, prendra part au septième congrès des Electro-radiologistes de langue française, qui aura lieu à Paris au mois d'octobre. Assisté de MM. Paul Levrier et Marcel Longtin, il traitera de la radiologie de l'œsophage terminal et du cardia.

Le Ministère fédéral de la Santé, conformément au nouveau programme d'hygiène, contribuera substantiellement à l'érection des sanatoriums de Macamic (Abitibi) et Bégin (Sainte-Germaine-du-Pont-Etchemin), et à l'agrandissement du Sanatorium Cooke des Trois-Rivières. Le Gouvernement fédéral entreprend également de fournir gratis la streptomycine aux patients des sanatoriums québécois.

PAUL DE BELLEFEUILLE

## General

**Course in Civil Aviation Medicine.** Thirty-four private physicians who carry out flying-fitness examinations for Canadian airplane pilots have been given an intensive course in the latest developments in aviation medicine at a special school held in Toronto from April 25 to 30. The school is the first known to be presented to purely civilian examiners in any country. Organized by Dr. H. E. Wilson, chief of the national health department's division of civil aviation medicine, it is being conducted in co-operation with the Department of Transport and the Royal Canadian Air Force.

Enrolled in the first course are the following doctors: C. E. Mather, Winnipeg; A. B. Manson, Vancouver; L. H. McConnell, Saskatoon; W. H. Scott, Edmonton; J. McDonald, Sault Ste. Marie; G. W. Bruner, Leamington, Ont.; G. C. Bradley, Regina; W. M. McLaren, South Porcupine, Ont.; J. D. Wallace, Wainwright, Alta.; M. M. Fisher, Gravenhurst, Ont.; N. A. Stewart, Vancouver; J. P. McGuigan, Montreal; W. G. Robertson, Carp, Ont.; S. H. McLeod, Calgary; J. F. McCullough, Sudbury, Ont.; J. P. George, Winnipeg; J. N. Lessard, Val d'Or, Que.; M. C. Novak, Yorkton, Sask.; R. H. Kinsman, Toronto; W. H. Coates, Amherst, N.S.; B. R. J. Violette, Dorval, Que.; L. C. Harris, Edmonton; W. W. Ruddick, Montreal; H. L. Sills, London, Ont.; G. D. Morris, Owen Sound, Ont.; G. J. Pelletier, Whitehorse, Y.T.; G. R. Johnston, Calgary; W. E. Brown, Toronto; C. P. Gaboury, Montreal; F. B. Sharp, Toronto; M. G. Kunkel, Humboldt, Sask.; P. Dagenais-Perusse, Montreal; W. L. Delaney, Quebec City; and R. J. Brown, Moncton.

This course is the first of three planned for this year. Enrolment is limited to doctors appointed by the Department of Transport to give medical examination to airplane pilots.

It has been decided that in view of the coincident International Congress on Rheumatic Diseases the annual meeting of the Canadian Rheumatism Association this year will consist of a business meeting only, to be held in New York, at the Waldorf Astoria Hotel, 5 p.m., on May 31.

Scholarships valued at $50,000 have been awarded by the Ontario Research Council to assist Canadian university graduates in postgraduate work. The scholarships range from $750 to $1,500 and are granted annually by the Ontario Government as a means of stimulating interest in research as a career. Winners fall into two classes: Graduates of Ontario universities who will continue studies either here or at universities outside the province and graduates of other provincial universities who will come to Ontario to study.

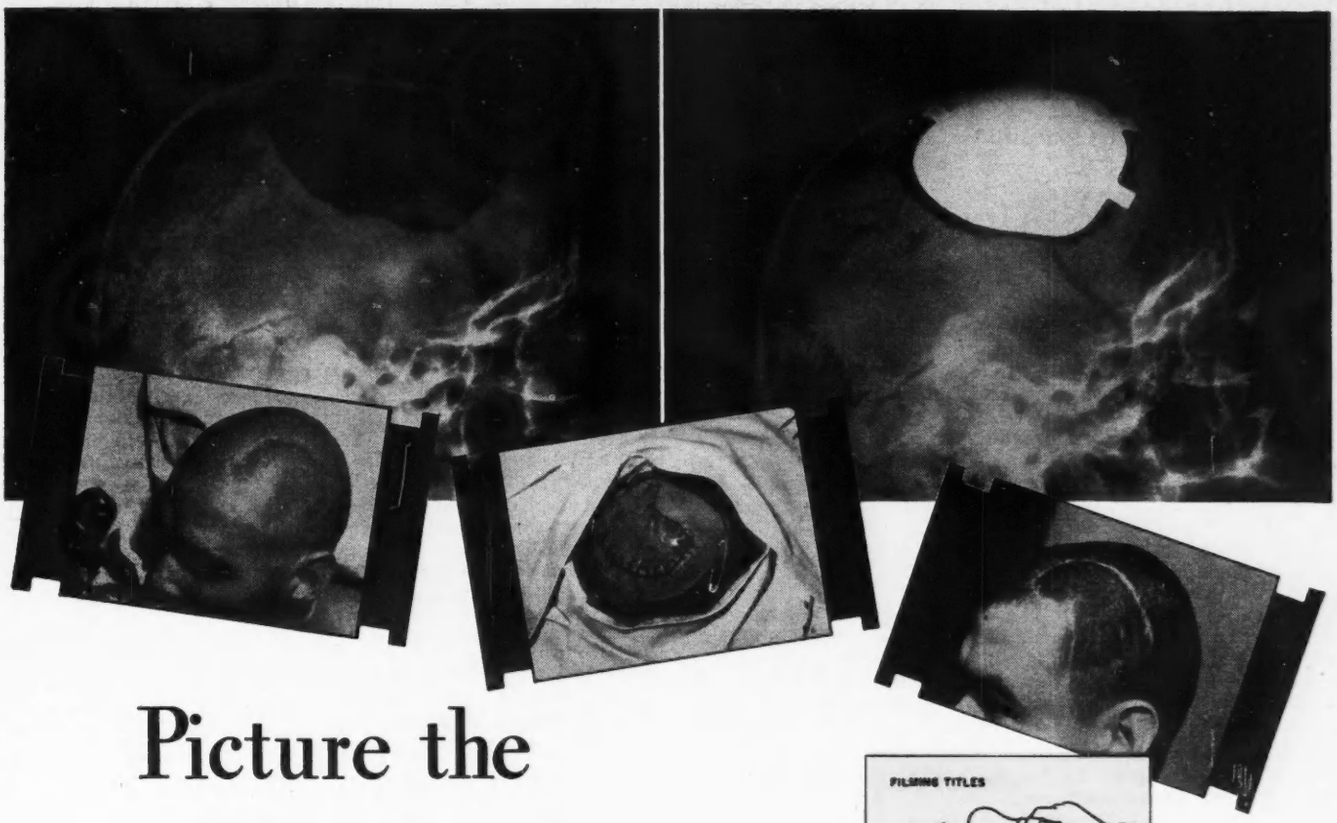
# BOOK REVIEWS

**Abdominal Operations.** R. Maingot, Surgeon to the Royal Free Hospital, London. 1274 pp., illust., 2nd ed. $16.00. Appleton-Century-Crofts, Inc., New York, 1948.

Mr. Maingot is not new as an author of surgical texts, having numerous previous successes to his credit notably the first edition of Abdominal Operations (which this volume now supplants) and the very large contribution known as Postgraduate Surgery. He is a writer and teacher of known ability and his experience in abdominal surgery is considerable. Consequently this present edition carries the authority of an author who has read and travelled widely and who has the personal experience to reinforce his opinions. He has wisely included a group of co-authors who write the sections in which they are acknowleged authorities, examples being Lester Dragstedt on vagotomy and Cuthbert Dukes on the pathology of rectal carcinoma. The volume is large, comprising 1274 pages, and covers not only the surgical technique but the etiology, signs, symptoms and pathology of all the lesions described. Many new chapters have been added, notably those on vagotomy and cancer of the cardiac end of the stomach and lower œsophagus. Minor flaws can be found in the lamentable shortness of the new chapter on portal hypertension, the continued inclusion of the antiquated operations of pyloroplasty and gastro-duodenostomy and the undue emphasis on exteriorization procedures for colon resection which on this side of the Atlantic are now rarely used because of the improved preoperative methods of bowel preparation and sterilization. The volume is well written, well printed and extremely well illustrated and should be considered a "must" for every general and abdominal surgeon.

**Functional Neuro-anatomy.** A. R. Buchanan, Professor of Anatomy, University of Colorado School of Medicine, Denver. 242 pp., illust. $7.30. Lea & Febiger, Philadelphia; Macmillan Co. of Canada, Toronto, 1948.

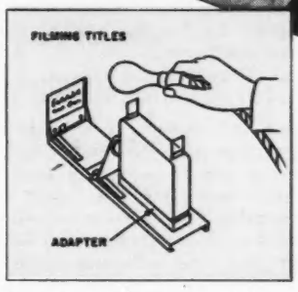
It is a source of satisfaction to be able to write only commendation of this book. The crowded detail of medical curricula has relegated the teaching of neuro-anatomy to a subsidiary position which makes the selection of a suitable text a very difficult problem. While the excellence of the large texts remains undisputed, they cannot be used satisfactorily by students preparing themselves in general medicine with little time. Dr. Buchanan has written a short, well illustrated text specifically designed for this need. To accomplish his purpose he has done considerable synthesis and presented each functional element of the nervous system as a continuous whole instead of chopping things up according to a cross-sectional approach. The only criticism is that the material is still heavy going although each sentence is trimmed and important; yet it is difficult to suggest how it be done otherwise. Clinical examples are integrated with the material rather than being tagged on. Perhaps in his next edition the author might be persuaded to append actual case histories, leaving the student the problem of locating the lesion, for, as in mathematics, so neuro-anatomy straightens itself out considerably when it is applied to specific problems.



# Picture the patient's progress

## ...with photograph...after photograph

Easy for the physician with a Cine-Kodak Magazine 16 Camera to make and edit his own motion pictures in color or black and white. The camera is simplicity itself. In addition, for the professional touch, there are available efficient editing accessories —for example, the Cine-Kodak Titler . . . the Master Editing Rewind with Editing Viewer and Senior Splicer. He can readily film his own titles, cut and splice . . . do a truly expert job of editing. For further information, see your nearest photographic dealer . . . or write direct to us. Canadian Kodak Co., Limited, Toronto 9, Ontario.




*Cine-Kodak Magazine 16 Camera fits on Cine-Kodak Titler with inexpensive adapter. An electric bulb is held directly above the lens standard.*

*Cine-Kodak Master Editing Outfit includes the Senior Splicer, the Editing Viewer, and the Master Editing Rewind mounted on a sturdy metal base. Cine-Kodak Titler (front) may be used for title making or copying.*

***Major Kodak products for the medical profession***

X-ray film; x-ray intensifying screens; x-ray processing chemicals; electrocardiographic film and paper; cameras—still- and motion-picture; projectors—still- and motion-picture; enlargers and printers; photographic films—color and black-and-white (including infrared); photographic papers; photographic chemicals; synthetic organic chemicals; Recordak products.

***Serving medical progress through Photography and Radiography***

"KODAK" IS A TRADE-MARK

Kodak

**Bacterial and Mycotic Infections of Man.** Edited by R. J. Dubos, Ph.D., The Rockefeller Institute for Medical Research. 785 pp., illust. $7.50. J. B. Lippincott Co., Philadelphia, London and Montreal, 1948.

Dr. Dubos speaks of "the multiple facets of the problem of infection". They are also exceedingly intricate. Bacteriology has long passed the stage at which its main aspects can be grasped by those concerned only with clinical applications. And yet infection is common ground to the clinician and the bacteriologist, and some attempt must be made, if not to simplify, certainly to bring together in convenient form, the various aspects of the infectious process. Both the infective agent and the responses of its host, man, must be considered. Thus it is that in this volume in addition to the morphology of organisms there are chapters on parasitism and disease; on response of the host to the parasite; the allergic state; immunology; blood groups; sterilization; chemotherapy; epidemiology, etc. These are in addition to the many chapters on the various groups of organisms and moulds. Viruses and rickettsiæ have been dealt with in another volume.

The contributors to the volume speak with authority. It would be too much to say that they have simplified bacteriology, for that cannot be done, but they have presented the subject in a form that can be followed by the practitioner; and there is great need for such a book.

**Hormontherapie.** L. Lendle und R. Schoen, Beiträge zur Arzneimitteltherapie Bd. II. By Prof. Arnold Loeser and Dr. Hellmut Marx. 152 + XI pp., 3rd ed. S. Hirzel Verlag, Leipzig, Germany.

This is the third edition of a book written in 1942. The second edition incorporated only minor changes while the present one is reprinted without change. As a result of this, much of the recent world literature which was unavailable in Germany during the war could not be considered. Nevertheless, the book is of interest to pharmacologists and pharmaceutical manufacturers inasmuch as it is the only modern textbook dealing with hormone principles from a purely pharmacologic point of view. The material is arranged in such a manner that the author discusses the hormones "according to their pharmacological action upon certain partial functions of the body—metabolism, growth, circulation, reproductive organs". It is preceded by a general introductory survey of the entire field and concluded by a section on "Clinical Hormone Therapy". Great attention is given to the preparation and standardization of hormone products. The extraordinary competence of the author—whose name is well known to endocrinologists especially because of his distinguished work in the field of thyroid physiology—is manifest throughout this booklet.

**Introduction to Bacteriological Chemistry.** C. G. Anderson, formerly Lewis Cameron Teaching Fellow, Bacteriology Department, University of Edinburgh. 500 pp., illust., 2nd ed. $4.50. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada, 1946.

This is an excellent and thorough survey of a field where the interests of biochemists and bacteriologists tend to merge. The physical-chemical basis of the metabolism of cells is well presented. The relationship of enzymes to bacterial metabolism is emphasized and the chapter on adaptive and constitutive enzymes is extremely interesting. There is very useful information given in certain tables; for example in the chapters on growth factors and chemotherapy. The discussions of chemotherapy and antibiotics are comprehensive. Bacterial respiration and metabolism are extensively and lucidly discussed. The material on immunochemistry is presented in the clear and interesting manner which characterizes the whole book.

This book can be recommended for teachers and graduate students in biochemistry and bacteriology.

**Diseases of Children.** Edited by Donald Paterson, Physician, Hospital for Sick Children, Great Ormond Street and Alan Moncrieff, Nuffield Professor of Child Health, University of London. 771 pp., illust., 4th ed. $7.50. Edward Arnold & Co., London, England; Macmillan Co. of Canada Ltd., Toronto, 1947.

This book covers a much wider field than the previous edition and so has been divided into two volumes. The first two hundred pages cover general considerations with chapters on heredity; vital statistics and administrative aspects; growth and development; the use of drugs in infancy and childhood; clinical pathology; water and electrolyte control and acid-base regulation; septicæmia, pyæmia and toxæmia; practical procedures, anæsthetics in the surgery of children and the feeding of infants and children. The second part is made up of chapters on the newly-born baby; diseases of nutrition; disorders of metabolism; diseases of the ductless glands; disorders of the alimentary system; congenital defects of the alimentary tract; diseases of the alimentary tract; diseases of the nose, pharynx, larynx and ears; diseases of the respiratory system; tuberculosis and allergy. This volume is highly recommended to the medical student, general practitioner and pædiatrician.

**Obstetrics and Gynæcology.** B. M. W. Dobbie, Honorary Surgeon, Birmingham and Midland Hospital for Women. 358 pp., illust. 20s. H. K. Lewis & Co. Ltd., London, 1948.

This book deals almost exclusively with treatment. It deals largely with the more common complications and disorders encountered in every day practice, and emphasis is laid on preventive treatment. Manipulative treatment is dealt with fully in the section of Gynæcology for the benefit of the general practitioner. Two chapters are devoted to "Domiciliary Midwifery", normal and abnormal. These two chapters are concise and deal largely with minor complications. The author rightly points out, that where possible, major abnormalities should be treated in a suitable institution. A special and timely chapter by Joan E. Greener, M.B., D.P.M., deals with the psychiatric aspect of gynæcology and obstetrics. This book is of special value to the general practitioner.

**Year Book in General Medicine, 1948.** Edited by P. B. Beeson, *et al.* 821 pp., illust. $4.50. The Year Book Publishers Inc., Chicago, 1948.

This annual publication should be securely entrenched by now as a must for the busy practitioner. As usual, the present volume provides up to date information on the significant advances of the past year, competently edited in each field. In the forefront stands the survey of the present status of chemotherapy, the major achievement of this decade, but other branches of medicine are thoroughly covered with appropriate editorial comment on the various papers discussed. This publication is undoubtedly one of the best and shortest routes to reliable and recent information.

**Surgery of the Stomach and Duodenum.** T. H. Somervell, Surgeon-in-charge, London Mission Hospital, Neyyoor, S. India. 546 pp., illust. $11.25. Edward Arnold & Co., London, 1948.

This book should prove of great value to anyone active in gastro-enterology, although it is designed primarily for the practical surgeon. The writing is personal, and derives its authority from an enormous experience in an area of India where chronic duodenal ulcer is perhaps more common than anywhere else in the world. The book is also a learned one, in the sense of being heavily documented from the

# LIVER EXTRACT INJECTABLE

## 15 UNITS PER CC.

Liver Extract Injectable is prepared specifically for the treatment of pernicious anaemia. The potency of this product is expressed in units determined by actual responses secured in the treatment of human cases of pernicious anaemia. Liver Extract Injectable as prepared in the Connaught Medical Research Laboratories has the following advantages:—

1. Assured potency—*Every lot is tested on cases of pernicious anaemia.*
2. High concentration of potency—*Small dosage and less frequent administration.*
3. Low total solids—*Discomfort and local reactions occur very infrequently because of the high purity of the product.*

Liver Extract Injectable (15 units per cc.) as prepared by the Connaught Medical Research Laboratories is supplied in packages containing *single* 5-cc. vials and in multiple packages containing *five* 5-cc. vials.

**ALSO AVAILABLE**

Liver Extract for Oral Use in powdered form is supplied in packages containing ten vials; each vial contains extract derived from approximately one-half pound of liver.

CONNAUGHT MEDICAL RESEARCH LABORATORIES
University of Toronto Toronto 4, Canada

world's literature regardless of nationality, and displays a sense for the historical development of gastric surgery which is missing from most modern textbooks. A unique and impressive feature of the book is that it has been illustrated by the author himself. The drawings are extremely simple and skilful, and have the quality of displaying at a glance the salient features which the illustration is designed to show. In the technical sections modern operations for the removal of œsophagus, stomach and duodenum are described in lucid detail. An original contribution consists in a description of a transdiaphragmatic extrapleural approach to the stomach and lower œsophagus. The tenth and eleventh ribs are removed on the left side, and the pleura is stripped off the diaphragm, posterior chest wall and lower mediastinum. The diaphragm is then incised parallel to the chest wall and the left crus divided. It is maintained that an exposure equivalent to the radical thoracoabdominal approach can be obtained without entering the pleural cavity. All sections of the book make excellent reading whether the author be writing as an anatomist, physiologist, pathologist, diagnostician or technical surgeon. The advice on the handling of the various emergencies arising from peptic ulcer, such as hæmorrhage, adds to the value of the book for all who must deal with such cases.

## BOOKS RECEIVED

**Achievements of BCG Vaccination.** G. Hertzbert, Medical Officer, Tuberculosis Department of the Oslo Public Health Service. 224 pp. I Kommisjon Hos Johan Grundt Tanum Forlag, Oslo, 1948.

**Biological Reactions Caused by Electric Currents and by X-rays.** J. Th. Van Der Werff, Radiologist of the St. Canisius Hospital, Nijmegen. 203 pp., illust. $5.00. Elsevier Publishing Co., Inc., New York, Amsterdam, London, Brussels, 1948.

**Clinical Chemistry in Practical Medicine.** C. P. Stewart, Reader in Clinical Chemistry, University of Edinburgh, and D. M. Dunlop, Christison Professor of Therapeutics and Clinical Medicine, University of Edinburgh. 324 pp., illust., 3rd ed. $4.50. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada, Toronto, 1949.

**Collateral Circulation.** Daniel P. Quiring, Head of the Anatomy Division, Cleveland Clinic Foundation and Associate Professor of Biology, Western Reserve University. 142 pp., illust. $5.60. Lea & Febiger, Philadelphia; Macmillan Co. of Canada, Toronto, 1949.

**Contributions to Psycho-analysis 1921-1945.** M. Klein with an introduction by E. Jones. 416 pp. $5.25. The Hogarth Press Ltd., London, and the Institute of Psycho-Analysis; Clarke, Irwin & Co. Ltd., Toronto, 1949.

**Diet in Relation to Reproduction and the Viability of the Young. Part I. Rats and other laboratory animals.** F. C. Russell, Commonwealth Bureau of Animal Nutrition. 98 pp. 6s. Technical Communication No. 16. Commonwealth Bureau of Animal Nutrition, Scotland, 1948.

**Forty-four Juvenile Thieves: Their Characters and Home-life.** J. Bowlby, Psychiatrist in charge Child Guidance University, Tavistock Clinic, London. 56 pp. $1.85. Baillière, Tindall & Cox, London; Macmillan Co. of Canada, Toronto, 1949.

**Handbook of Diseases of the Skin.** R. L. Sutton, Emeritus Professor of Dermatalogy and Syphilology, University of Kansas Medical School; and R. L. Sutton, Jr., Associate Professor of Dermatology and Syphilology, University of Kansas Medical School. 749 pp., illust. $13.75. The C. V. Mosby Co., St. Louis; McAinsh & Co. Ltd., Toronto, 1949.

**Handbook of Midwifery.** M. Puxon, late Gynæcological and Obstetric Registrar, Birmingham United Hospitals. 326 pp. 25/-. Sylviro Publications Ltd., London, 1949.

**Handbook of Surgery.** E. C. Mekie, Professor of Clinical Surgery, King Edward VII College of Medicine, Singapore; and I. MacKenzie, First Assistant, Department of Surgery, University of Durham. 764 pp., illust., 2nd ed. $5.00. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada Ltd., Toronto, 1949.

**Hindu Medicine.** H. R. Zimmer, late Visiting Lecturer in Philosophy at Columbia University. Edited by L. Edelstein, Ph.D. 203 pp. $4.00. The Johns Hopkins Press, Baltimore, 1948.

**History of Medicine.** C. C. Mettler, late Assistant Professor of Medical History, University of Georgia, School of Medicine. Edited by F. A. Mettler, Associate Professor of Anatomy, College of Physicians and Surgeons, Columbia University. 1215 pp., illust. $9.75. The Blakiston Co., Philadelphia and Toronto, 1947.

**Measurements of the Public Health.** F. A. E. Crew, Professor of Public Health and Social Medicine, University of Edinburgh. 243 pp. 18/-. Oliver & Boyd, Edinburgh and London, 1948.

**Nursing Care of Neurosurgical Patients.** R. M. Klemme, Professor of Surgery, Saint Louis University School of Medicine, St. Louis, Missouri. 117 pp., illust. $3.75. Charles C. Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1949.

**Safeguarding Motherhood.** S. T. DeLee, Clinical Instructor of Obstetrics and Gynæcology, University of Illinois. 135 pp., illust. $2.50. J. B. Lippincott Co., Philadelphia, London, Montreal, 1949.

**Social Medicine: Its Derivations and Objectives.** Edited by I. Galdston. 294 pp. $2.75. The Commonwealth Fund, New York, N.Y.

**Structure of Medicine and its Place Among the Sciences.** F. M. R. Walshe. 26 pp. $0.40. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada, Toronto, 1949.

**Studies in Air Hygiene.** R. B. Bourdillon, O. M. Lidwell and J. E. Lovelock. 356 pp., illust. 7s. 6d. His Majesty's Stationery Office, London, 1948.

**The Business Side of Medical Practice.** T. Wiprud, Executive Director and Secretary of the Medical Society of the District of Columbia and Managing Editor of the Medical Annals of the District of Columbia. 232 pp., illust., 2nd ed. $4.00. W. B. Saunders Co., Philadelphia and London; McAinsh & Co., Ltd., Toronto, 1949.

**The Hospital in Contemporary Life.** Edited by N. W. Faxon, Director, Massachusetts General Hospital. 288 pp., illust. $6.25. Harvard University Press, Cambridge, 1949.

**The Normal Child.** A. Brown, Physician-in-Chief, Hospital for Sick Children, Toronto, and Elizabeth Chant Robertson, Clinical Assistant, Hospital for Sick Children, Toronto. 274 pp., 4th ed. McClelland & Stewart Ltd., Toronto, 1948.

Continued on page 40